

NATURAL HISTORY

Edited by

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16731

Vol. II

VICTORY BOOKS INTERNATIONAL
DELHI-110006

VICTORY BOOKS INTERNATIONAL
1719, Eagle Building, Lal Kuan, Delhi-110006

574-03
R 261 F } cd

TWO VOLUMES

Price : Rs. 950

*Published by K. L. TANEJA, for Victory Books International,
1719, Eagle Building Lal Kuan, Delhi-110006 and printed at
Lakshmi Printing Works, Lal Kuan Delhi- 110006*

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BIRDS (Aves)

BY

W. B. ALEXANDER, M.A. (Camb.), *Director of Research in
Economic Ornithology, University of Oxford*

Birds (Class Aves) are warm-blooded vertebrate animals covered with feathers. The fore limbs are typically wings adapted for flying, but in the Penguins they are flippers used as paddles in swimming, and in some terrestrial birds are degenerate, and useless for flight. The hind limbs serve for progression on land, for climbing or perching in trees, or for swimming. The jaws are covered with horny sheaths forming a beak or bill, used not only for securing food, but for picking up and holding sticks and other objects, for defence, and, in some instances, as an accessory to the feet when climbing. All birds lay eggs of comparatively large size enclosed in a calcareous shell. These are deposited in a more or less elaborate nest and, except in the Mound-birds, are incubated until they hatch.

Birds exhibit a more intense vitality than that found in any other group of animals. Their temperature is maintained at a constant level from 2° F. to 14° F. higher than in Mammals. Their blood is richer than that of Mammals in red corpuscles, and the circulation is maintained by very rapid heart-beats. Their breathing also is very rapid, and the bronchial passages extend through the lungs into thin-walled air-sacs which lie among the viscera and even penetrate into the bones. Thus the air passes through the lungs both during inspiration and expiration instead of merely being drawn into the lungs and expelled again as in other vertebrate animals. The digestive processes of birds are also very rapid and perfect, almost the whole of the food being absorbed. Many forms, notably Owls and Hawks, eject the indigestible portions of their food, such as bones, hair, feathers and the wing-cases of beetles, from the mouth in the form of pellets. The faeces consist largely of nitrogenous matter excreted by the kidneys, hence bird guano has high value as a fertilizer.

Plumage. Feathers form the body-covering of all birds, and are found in no other creatures. A typical feather consists of a stem with lateral branches or barbs forming a web on each side. The quill, or lower portion of the stem, is hollow and roughly cylindrical, and the shaft, or upper portion, which bears the barbs, is somewhat quadrangular and solid. The barbs project obliquely on both sides of the shaft, approximately in one plane, and in their turn bear smaller oblique branches, or barbules, on both sides in the same plane. The barbules of adjacent barbs interlock by means of minute hooks, thus forming a practically air-tight web. Feathers of this type form an external covering to the body and are known as contour feathers. Beneath them are feathers with a soft shaft, whose barbules have no hooks, forming the down. There is a special development

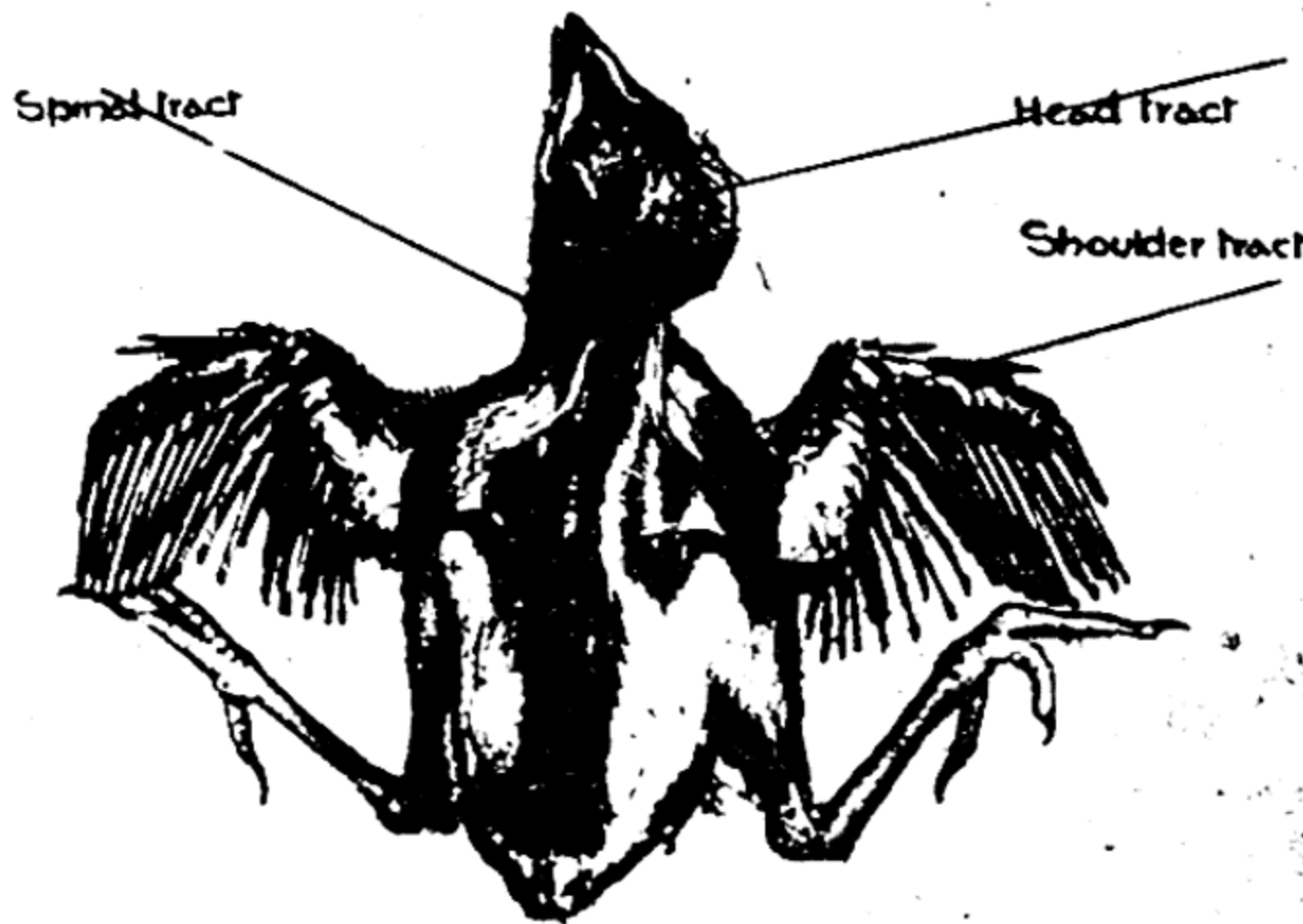
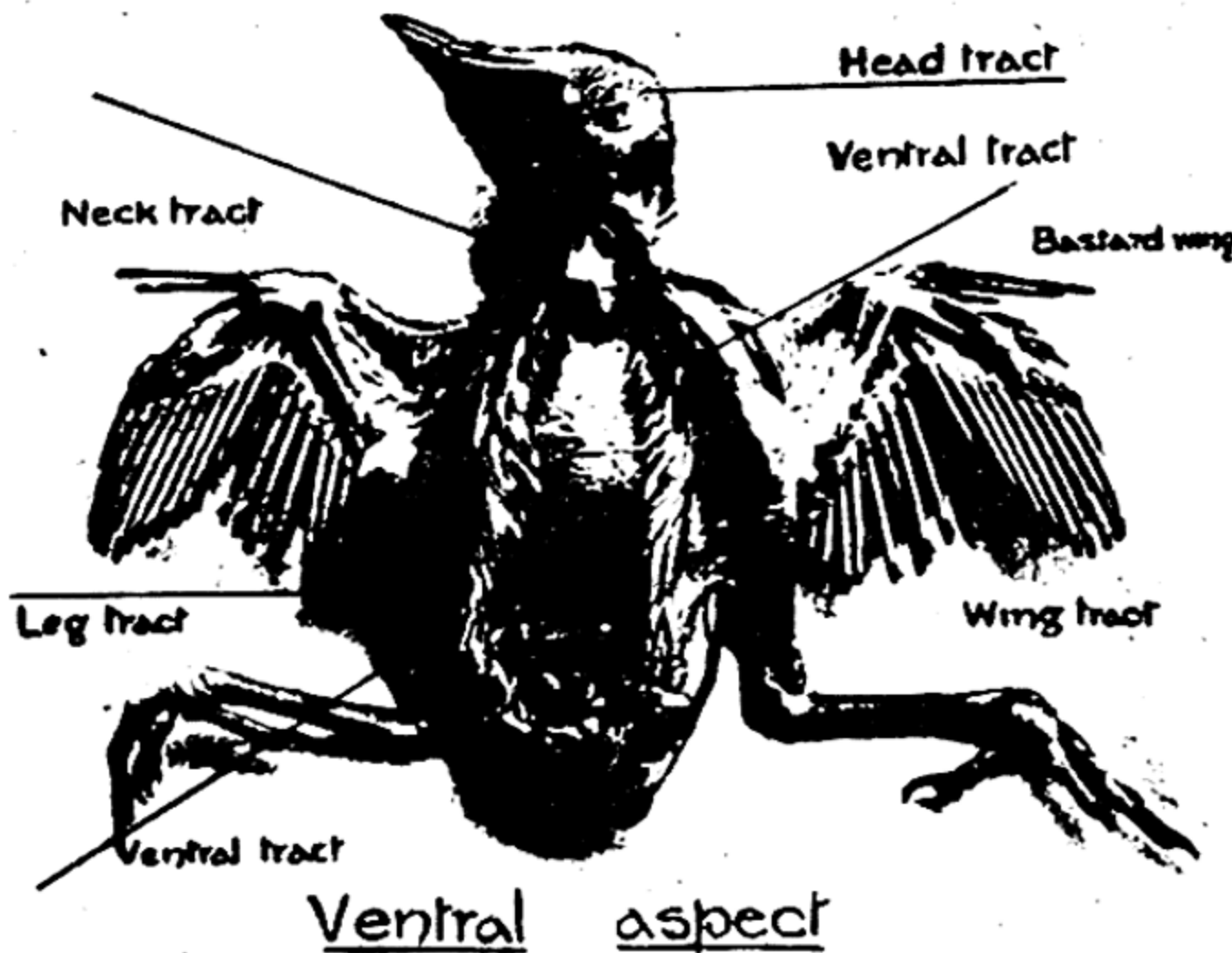
AVES (BIRDS)

of down in many birds of cold regions, especially those of aquatic habits, such as Penguins and Ducks.

In flying birds, specially large feathers are attached to the bones of the wings. Those attached to the bones which correspond to the hand are known as *primaries*, and are usually the largest. Those attached to

the fore-arm are named *secondaries*. The bases of these wing-quills are covered by other fairly large feathers known as the *wing-coverts*. The tail of birds is very small, but specially large feathers are usually attached to it; these tail feathers serve for steering and for braking during flight; their bases are covered by smaller feathers known as *tail-coverts*.

Flight. The flight of birds differs essentially from that of aeroplanes in that the wings correspond both to the propeller and the planes. By flapping its wings backwards and downwards, the bird acquires speed and lift, and when these are obtained, it can glide for a greater or less distance with its wings spread. In normal flight flapping and gliding alternate. Certain species, e.g. Humming-birds and Kestrels, can maintain a stationary



[H. Bastin.
A nestling perching-bird, showing the sprouting contour feathers developing in special tracts, not uniformly scattered over the body.

position in the air by beating their wings very rapidly; this is hovering. Some other birds, notably Albatrosses and Vultures, when once they have acquired speed, can continue to circle round in the air for hours without further wing-beats. This is termed soaring, and how it is accomplished is still not completely understood.

Migration. The phenomenon of migration is met with in various

FLIGHT—MIGRATION



(1) Part of (2) enlarged, showing barbules springing from the barbs.

thereby enabling the movements of individuals to be traced. By this means it has been proved that, although Wild Ducks and Starlings bred in the British Isles are mainly stationary, many from Scandinavia and the Baltic countries are also present in Britain during the winter. In these species British birds are stationary, although Scandinavian birds are migratory. There are also a very large number of species, all of whose members are migratory. For example, the Swallows, Cuckoos and Storks, which breed in Europe in summer, spend the northern winter in tropical or southern

groups of animals, but, doubtless owing to their great powers of locomotion, is specially conspicuous in birds. Although some individual birds apparently never travel more than a few miles from the place where they were hatched, it is probable that there are few species in which this is true of all the members. Within recent years much information on migration has been gained by placing light, numbered rings on the legs of birds,



(2) Barbs springing from the shaft or rachis.



Photos) (H. Bastin.
STRUCTURE OF A FEATHER.
(3) Part of (2) greatly enlarged showing the minute hooks on the barbules.

Africa. Evidence is accumulating that such migratory birds often have two quite definite homes, one in the north where they breed, and the other in the south where they winter, individuals returning annually to the same fields or gardens at both ends of their journey. In the southern hemisphere movement takes place in the opposite direction, though on a smaller scale, numerous species that breed in Patagonia, New Zealand and Tasmania migrating north into the

AVES (BIRDS)

tropics for the winter. Even within the tropics, seasonal movements take place. In most species the journey is mainly, or entirely, made during the hours of darkness, and in many it involves passage over hundreds of miles of open sea ; but how the birds find their way is not known. In some species, individuals migrate independently ; in others, flocks travel together ; frequently young birds of the year migrate independently of the adults.

Voice. The syrinx, which is the organ of voice in birds, is situated at the lower end of the windpipe (trachea), at the point where it bifurcates into the two tubes (bronchi) which lead into the lungs. The syrinx differs greatly in form in different types, but consists essentially of a cavity with membranous walls, and containing membranous flaps or valves. Muscles attached to the various parts can modify the form of the syrinx, and alter the tension of the valves. Most birds utter frequent notes or calls, varying according to their emotions. In many species, as the breeding season approaches, the male birds spend much of their time in singing, generally repeating a series of notes in a particular order. Songsters of the highest rank, however, vary the order of the notes almost indefinitely. Song is undoubtedly primarily the expression of emotion during a period of high vitality, but it serves also to advertize the presence of a male to rivals and to females. There can be no question that the bird is to some extent an artist capable of enjoying its own performance, and birds of many species sing at periods other than the breeding season.

Classification. The known species of birds number about twelve thousand, but although they are more numerous than in Mammals or Reptiles, the structural differences between them are comparatively small. In a recent system of classification (that of Wetmore and Miller, which is here followed) they are divided into thirty-three orders, of which six are extinct and twenty-seven have living representatives. The orders are grouped as follows :

Sub-class 1. ARCHAEORNITHES

Order 1. *Archaeopterygiformes* (Extinct).

Sub-class 2. NEORNITHES

Superorder 1. *Odontognathae* (Extinct).

Order 1. *Hesperornithiformes*.

Order 2. *Ichthyornithiformes*.

Superorder 2. Palaeognathae

Order 1. *Struthioniformes* (Ostriches). Order 5. *Aepyornithiformes*

„ 2. *Rheiformes* (Rheas).

(Extinct).

„ 3. *Casuariiformes* (Emus and Cassowaries).

„ 6. *Apterygiformes* (Kiwis).

„ 4. *Dinornithiformes* (Moas, Extinct).

„ 7. *Tinamiformes* (Tinamous).

CLASSIFICATION

Superorder 3. Neognathae

- | | |
|--|---|
| <p>Order 1. <i>Sphenisciformes</i> (Penguins).
 „ 2. <i>Colymbiformes</i> (Divers).
 „ 3. <i>Podicipiformes</i> (Grebes).
 „ 4. <i>Procellariiformes</i> (Petrels and Albatrosses).
 „ 5. <i>Pelecaniformes</i> (Pelicans, Cormorants, etc.).
 „ 6. <i>Ciconiiformes</i> (Storks, Herons, etc.).
 „ 7. <i>Anseriformes</i> (Ducks, etc.).
 „ 8. <i>Falconiformes</i> (Birds of Prey).
 „ 9. <i>Galliformes</i> (Game-birds).
 „ 10. <i>Gruiformes</i> (Cranes, Rails, Bustards, etc.).
 „ 11. <i>Diatrymiformes</i> (Extinct).
 „ 12. <i>Charadriiformes</i> (Plovers, Gulls, Auks, etc.).</p> | <p>Order 13. <i>Columbiformes</i> (Pigeons and Sand-grouse).
 „ 14. <i>Cuculiformes</i> (Cuckoos, etc.).
 „ 15. <i>Psittaciformes</i> (Parrots).
 „ 16. <i>Strigiformes</i> (Owls).
 „ 17. <i>Caprimulgiformes</i> (Nightjars, etc.).
 „ 18. <i>Micropodiformes</i> (Swifts and Humming-birds).
 „ 19. <i>Coliiformes</i> (Colies).
 „ 20. <i>Trogoniformes</i> (Trogons).
 „ 21. <i>Coraciiformes</i> (Hornbills, Kingfishers, etc.).
 „ 22. <i>Piciformes</i> (Woodpeckers, Toucans, etc.).
 „ 23. <i>Passeriformes</i> (Song-birds or Perching-birds).</p> |
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The extinct Jurassic toothed birds present many reptilian features that entitle them to rank as a separate sub-class, named either *Archaeornithes* (Ancient Birds) or *Saururae* (Lizard-tailed), the latter name having reference to the very long tail, each vertebra of which bears a pair of feathers. The remaining birds form collectively the sub-class *Neornithes* or *Ornithurae*, distinguished by a much shorter tail, with the last five or six vertebrae united to form a bone that supports the tail-feathers, which spread out like the ribs of a fan.

The *Odontognathae* are toothed birds found fossil in the Cretaceous strata ; the other two divisions of the *Neornithes* take their names from the arrangement of the bones of the palate. In the *Palaeognathae* the palatine bones are well separated by the vomer, and are more or less firmly attached to the pterygoids, whereas in the *Neognathae* the palatines converge behind the vomer, and are movably attached to the pterygoids by a cup-and-ball joint.

Sub-class ARCHAEOORNITHES

Order ARCHAEOPTERYGIFORMES (Extinct)

This order contains the single Family *Archaeopterygidae*, which includes two fossil creatures whose skeletons have been found in Jurassic strata in Bavaria. The first, discovered in 1861 in the lithographic slate of Solenhofen, is now in the Natural History Museum, South Kensington, and is known as *Archaeopteryx lithographica*. This name was originally bestowed on a feather previously discovered in the same locality. In 1877 a second individual in a much better state of preservation was found near Eichstätt and is now in the Berlin Museum. It was for long thought to be another example of the same species, but recent critical study has indicated several differences in the skeleton, and it has been named *Archaeornis siemensii*.

The fact that they were clothed with feathers has led to the inclusion of these creatures in the Class Aves, but in almost every feature of their skeleton they differed greatly from modern birds, agreeing with one or other of the orders of Reptiles, and they might aptly be termed "Feathered Reptiles." The skull is quite reptilian in character and the jaws are furnished with teeth in separate sockets. The head was probably covered with scales, the nostrils opened near the tip of the snout and there was no horny sheath or "beak" covering the jaws. The eyes were very large. The front limb had three fingers, each provided with a sharp, curved claw; along its posterior margin there was a row of strong quill feathers. The breast-bone is absent in both fossils, but the space it occupied shows that it was small, and it is possible that it has not been preserved because it was cartilaginous. In that case, the fore limbs cannot properly be regarded as wings and the creatures would have been incapable of true flight, but able only to glide through the air in the manner of "Flying Squirrels." The hind limbs were slender, and the feet had three toes in front and one behind, each with a sharp, hooked claw. Superficially these legs are the feature in which these creatures most resembled modern birds, but the bones of the foot are not reduced and fused in the manner characteristic of birds. The most obvious reptilian character is the long, slender tail, like that of a lizard, in length about equal to the body. The tail, however, was furnished with strong quill-feathers arranged in pairs. The body was also covered with softer feathers. *Archaeopteryx* had a body about the size of that of a crow; *Archaeornis* was a little smaller.

There can be no doubt from the structure of the feet that these creatures were arboreal and they doubtless used the claws on their hands to assist them in clambering about the branches, probably, as already suggested, gliding from tree to tree by the support of the large wing and tail feathers. As a complete link between Reptiles and Birds, they form convincing evidence of the evolution of the latter group from the former.

Sub-class NEORNITHES

Superorder ODONTOGNATHAE (Extinct)

Order HESPERORNITHIFORMES

This is a group of flightless, aquatic, toothed birds found as fossils in rocks of Cretaceous age. It includes at least two, and possibly three, families: *Hesperornithidae*, *Baptornithidae* and *Enaliornithidae* (?).

Hesperornithidae. This family contains a number of species from the Niobrara beds of western Kansas, some of which are known from practically complete skeletons. They had greatly-elongated bodies and long necks. Their jaws contained sharply-pointed teeth placed in continuous grooves, though in the upper jaw the teeth were confined to the posterior portion. Their wings were rudimentary and their breast-bones without a keel. Their short, strong legs were placed far back and set at right angles to the body, whilst their paddle-like feet resembled those of Cormorants. In their general form, and probably in their habits, they resembled the Divers, except, of course, that they were flightless. *Hesperornis regalis* attained a length of six feet and *H. crassipes* was even larger.

Baptornithidae. This family contains the genus *Baptornis* from the same deposits as those in which *Hesperornis* is found, but as its jaws are not known it is not certain that it was toothed.

Enaliornithidae. This family contains *Enaliornis* from the Cambridge Greensand of England. It was much smaller than *Hesperornis*, but similar in general form of body, though its jaws are unknown, so that it may not have had teeth.

The remains of various other fossil birds from Cretaceous deposits indicate that there was already great diversity among the birds of that period. *Palaeotringa* had the form of a Wader, *Telmatornis* that of a Rail, and *Laornis* that of a Duck. But since the only Cretaceous birds whose jaws are known (*Ichthyornis* and *Hesperornis*) were toothed, though very dissimilar in other features, it seems probable that this was a characteristic of all birds at that period.

Order ICHTHYORNITHIFORMES

This order contains only one known family, the *Ichthyornithidae*, which includes several species whose remains have been found in the Niobrara beds of Cretaceous age in western Kansas. The two that are best known, *Ichthyornis victor* and *I. dispar*, had the body about as large as that of a pigeon. They had long necks; large, strong heads; and long pointed bills. In each jaw there were many small, sharply-pointed, recurved teeth set in sockets, whilst the two jaw-bones of the lower jaw were not united at the tip. In these features they agree with reptiles and differ from all modern birds, whilst the form of their vertebrae, which were bi-concave, is even more primitive, being that found in fish and in some

AVES (SUPERORDER PALAEOGNATHAE)

amphibians. The wings were large, long and strong and the breast-bone had a deep keel, so that there is no doubt they were powerful fliers. Their legs and feet were comparatively weak. They probably resembled Terns in appearance and habits.

Superorder PALAEOGNATHAE

Order STRUTHIONIFORMES (Ostriches)



By courtesy of [Carl Hagenbeck's Tierpark, Stellingen.
COCK OSTRICH (*Struthio camelus*).
A fine specimen of the largest living bird, showing the beautiful plumes for whose sake it is farmed in South Africa.

This order includes a single family, *Struthionidae*, containing only one existing species, viz., the Ostrich (*Struthio camelus*), the largest living bird. It occurs in most parts of Africa from the Sahara southwards, and in the Arabian and Syrian deserts, but in the settled parts of South Africa it is now found only in a domesticated state. An adult male stands eight feet high, but females are somewhat smaller. The Ostrich has a very wide, flat bill; small head with large eyes; long neck scantily covered with down which does not hide the skin; enlarged, soft, ornamental plumes in the small wings and the tail; very long, large legs, with the lower part of the "thigh" devoid of feathers; feet with only two large toes, padded beneath, and with broad, stunted claws, that of the outer toe being frequently absent. The body of the adult male is covered with black

feathers, whilst the ornamental plumes of the wings and tail are white. Females and young males have all the feathers grey. The skin of the neck and "thigh" is flesh-coloured in birds from northern Africa, bluish in South African birds, and lead-coloured in those from Somaliland.

The Ostrich frequents deserts and open plains, associating in small flocks, and showing a liking for the companionship of zebras, hartebeests and other antelopes. Its speed is very great, exceeding that of a galloping horse, but it usually runs in a curve so that it is possible to overtake it on horseback by keeping a straighter course. When running, the head is held forward and the wings are outspread. It defends itself with its beak and by kicking, and its kick is so powerful as to be very dangerous. It feeds largely on herbage, but is practically omnivorous and has a propensity for swallowing stones, bones, nails, etc. The Ostrich can exist for a long

OSTRICHES—RHEAS

time without water, but drinks regularly when it has the opportunity, and is fond of bathing. It is generally a silent bird, but at times utters a deep roar like that of a lion. The male is polygamous and several hens lay in the same nest, a mere depression in the sand. The male incubates at night, but the hens sometimes sit in the daytime. The nest may contain thirty or more eggs, which in the northern race have a smooth shell like ivory, but in the southern race are pitted. The chicks run as soon as they are hatched, and are clothed in bristly, yellowish-white down with blackish stripes.

Order RHEIFORMES (Rheas)

The Rheiformes include only a single family, the *Rheidae*, containing two species of large flightless birds found in South America—the Common Rhea (*Rhea americana*), and Darwin's Rhea (*Pterocnemia pennata*). Rheas have wide, flat bills; long necks; small wings; no specially-developed tail feathers; long, stout legs; and feet with three stout toes with large claws. The head and neck are covered with short feathers, as are also the legs down to, or below, the "knee." The feathers of the body are large, rounded and soft, and are largely used for making feather-dusters. In colour, the different species vary considerably, but are generally grey or greyish-brown above and whitish below.

Rheas frequent open plains and run swiftly with the wings partly spread. They feed on grass, roots, seeds and berries as well

as on small reptiles, insects and molluscs. The males are polygamous and fight fiercely in the spring. The members of the harem all lay in the same nest, a mere hollow in the ground, or scatter their eggs round about. The eggs, which are yellowish or greenish when fresh, but soon fade to white, are incubated entirely by the male, who generally sits on from twenty to thirty. He also cares for the brood. The chicks of the smaller species are covered with soft down, but in the larger one are hatched with a covering of stiff, hair-like feathers.



(James's Press.
RHEA OR SOUTH AMERICAN OSTRICH
(*Rhea americana*).
The largest American bird, an inhabitant of the "pampas."

Order CASUARIIFORMES (Emus and Cassowaries)

A group of large, flightless birds found in Australia, New Guinea and some of the adjacent islands. They have long necks ; rudimentary wings ; no special tail-feathers ; fairly long, stout legs ; and feet with three strong front toes. The feathers, like those of Moas, appear to be double, since the aftershaft, which in other birds is a very small branch from the main feather, is in these birds almost or quite as long as the main shaft. The order contains three families, of which two have living representatives, viz : *Dromornithidae* (Dromornis and Genyornis, extinct) ; *Dromaeidae* (Emus) ; and *Casuariidae* (Cassowaries).

Dromornithidae. This family contains two or three large extinct birds including *Dromornis australis*, found in Pleistocene or Pliocene beds in Queensland and *Genyornis newtoni* from the Pleistocene of South Australia. The latter was a gigantic bird with an enormous skull.

Dromaeidae (*Emus*). This family contains only one living species found in Australia, but two smaller species existed when Australia was first colonized, one on King Island in Bass Strait, the other on Kangaroo Island off South Australia. Both were exterminated early in the 19th century by settlers and sealers, who captured great numbers for food.

The Emu (*Dromaeus novaehollandiae*) is still common over much of the Australian continent, but has disappeared from the more settled districts and has been extinct in Tasmania since about 1860. It is second in size among living birds, being surpassed only by the Ostrich. It has a wide, flat bill ; its head and upper neck have only a sparse clothing of short, black, hair-like feathers, which do not obscure the bluish colour of the skin of the neck ; its body is clothed with brownish-black feathers, somewhat barred with yellowish and black ; and, as in Kiwis and Penguins, its rudimentary wings are entirely without quill feathers. It frequents grassy plains and open forest country, running swiftly when alarmed and feeding on grass, leaves, berries and fruit. The nest is a depression in the ground, sometimes lined with grass, sticks and leaves, and in it from seven to eighteen eggs are laid. These are from five to five and a half inches long, dark green with a granulated surface. Both sexes usually share in incubation, though sometimes it is undertaken by the male alone. The downy chicks are broadly striped with black and greyish-white, and run as soon as they are hatched.

Casuariidae (*Cassowaries*). There are about half a dozen living species of Cassowaries found in New Guinea, the Papuan Islands, Ceram and North Queensland. An extinct bird, *Hypselornis sivalensis*, from Pliocene beds of the Sivalik Hills in India, shows that the family formerly had a wider distribution.

Cassowaries range in size from that of a Turkey to a bird standing five feet high. They have strong, compressed bills, curved at the tip ; a horny helmet or casque on the top of the head, varying in form in the different species ; fairly long, thick necks, devoid of feathers on the upper part,

EMUS, CASSOWARIES AND MOAS

where the skin is wrinkled and ornamented with caruncles and pendent wattles ; rudimentary wings, bearing four or five stiff quills without any webs, like the spines of porcupines ; moderately long, very robust legs ; and feet with three toes, of which the inner has a long, sharp, straight claw, which is a formidable weapon. The plumage is always black in adult birds, brown in the young. The naked skin of the head and neck is brightly coloured, often largely blue, with orange, pink, red or white patches, caruncles and wattles.

Cassowaries frequent dense jungles, through which they push their way, with the horny casque forming a protection for the head. At dusk and in the early morning they leave the denser cover and are often found near water. They can run swiftly, but heavily, and jump over obstacles of a considerable height. Their food consists of jungle fruits, berries and other vegetable matter, varied with insects and crustacea. The nest is a depression in dense cover, usually at the foot of a tree, lined with leaves and grass. The three to eight eggs are light green, with close-set granulations of dark green. The male alone is said to incubate and care for the brood. The downy chicks are pale brown with longitudinal black stripes, and run from birth.



[James's Press.
EMU (*Dromaeus novaehollandiae*).
The second largest of living birds, widely distributed in Australia.

Order DINORNITHIFORMES (Moas)

This order includes a single family, *Dinornithidae*, of extinct, flightless birds peculiar to New Zealand. Over twenty species of Moas are represented among the bones which have been collected in that country and two of them, *Dinornis giganteus* of the North Island and *D. maximus* of the South Island, were the largest birds known, probably standing twelve feet high. The smallest species was about the size of a Turkey. They all had long necks, rudimentary wings and long legs ; in some species the legs and feet were also extremely stout. The feet had three stout toes with strong claws and the hind toe either absent or small and elevated. The bill was wide and flattened, but differed considerably in form in the different species. In addition to bones, feathers and portions of skin with feathers attached

AVES (ORDER AEPYORNITHIFORMES)



[James's Press.

CASSOWARY (*Casuarus casuarus*).

An inhabitant of the jungles of New Guinea, Ceram, the Aru Islands and North Queensland.

have been obtained. These show that the feathers were double, like those of Emus ; that they varied in colour—some being reddish-brown, then black with a white tip, others yellow with purplish-brown borders, and others white ; that they were sometimes as much as seven inches long ; and that the whole head and neck and the legs down to the toes were feathered. Maori tradition states that Moas had crests and tufts of longer feathers on the tail. Pitting of the skull bones indicates that some species had crests, but its absence shows that others had not. According to tradition Moas lived in the open country, ran swiftly and defended themselves by kicking ; both dogs and men are said to have been killed by a kick from a Moa. They lived on fern-roots, leaves and grass, also on fruits, to obtain

which they entered forests, and on freshwater mussels, crayfish and fish, obtained in the streams. That they swallowed stones, like Ostriches, Emus, etc., is shown by the fact that little piles of these gizzard-stones, rounded pebbles of white quartz, are frequently found among their remains. Four perfect eggs and many bits of egg-shells have been discovered ; some of these had a pale green colour. The largest egg, probably that of *Dinornis maximus*, measures about ten inches by seven inches, and thus is much smaller than that of the *Aepyornis*. That some at least of the species were still living in New Zealand when the Maoris arrived there is certain, but the date of their final extermination is unknown.

Order AEPYORNITHIFORMES

This order contains a single family, *Aepyornithidae*, including the extinct species of the genus *Aepyornis*, and allied forms, found in Madagascar. About twelve kinds of these birds have been described from bones found in the island, and the largest probably stood about seven feet high. They had long, stout legs ; feet with four toes ; rudimentary wings and very small breast-bones. Large pits on the bones of the forehead indicate that they had crests. A number of their eggs have been found and exceed

KIWIS (APTERYGIDAE)

all other known eggs in size, and it is probable that these gave rise to the legend of the gigantic *Roc*, which was said to inhabit Madagascar. If so, however, their size was enormously exaggerated, as they actually measure about thirteen inches by nine and a half inches, and hold about two gallons. Some of the bones of one of the smaller species show marks of a cutting instrument, so it is probable that the birds were exterminated by the Malagasy, perhaps surviving till the 17th century.

Order APTERYGIFORMES (Kiwis)

The *Apterygiformes* contain only the single family *Apterygidae*, which includes three species of flightless birds found in New Zealand. They have long, slender bills, slightly curved downwards, and differ from all other birds in having the nostrils situated close to the tip of the upper mandible instead of near its base. The head is small, the wings rudimentary and hidden in the feathers and the tail absent. The legs are very stout and placed far back, and the feet have three strong toes with long claws in front and a small elevated hind toe. The plumage is rufous- or greyish-brown, streaked or barred with blackish, and the feathers are long and hair-like. On the head near the base of the bill there are numerous long hairs and the eyes are small and weak.

Kiwis frequent damp forests and are nocturnal in habits, spending the day in burrows or holes under fallen trees. At dusk they become active, probing soft ground, decaying logs or beds of moss, with their bills, for the earthworms and grubs on which they chiefly feed; though they also eat berries, seeds and tender shoots of plants. Their shrill, whistling call, generally uttered in the evening, resembles the name Kiwi, bestowed on them by the Maoris. This is the note of the male, that of the female being lower and hoarser.

The nesting place is a burrow, hole or hollow log, usually lined with sticks, ferns, grass or leaves. One, two, or occasionally three, eggs are laid, white or pale greenish in colour, and remarkable for their great size compared with that of the parent; they weigh about a quarter the weight of the female. Incubation is generally, or always, performed by the male.



By courtesy of] [the High Commissioner for New Zealand.
KIWI (*Apteryx australis*).
The most remarkable of the curious birds of New Zealand.



JACKASS PENGUIN (*Spheniscus demersus*).
The bird is here seen under water in the act of catching a fish.

[Neville Kingston.]

Order TINAMIFORMES (Tinamous)

This Order includes only a single family, *Tinamidae*, containing about fifty species distributed throughout South America and northwards to Southern Mexico. Tinamous vary in size from that of a Quail to that of a Fowl and have a considerable general resemblance to Partridges. By Europeans in South America they are commonly called Partridges or the equivalent of that name in Spanish or Portuguese. The resemblance is, however, only superficial and in many points of their structure they agree with the primitive flightless Ratite birds (Ostriches, Rheas, Emus, Kiwis, etc.). They have small heads and rather long necks, clothed with very small feathers; the horny sheath of the bill is in several pieces; their short, rounded, concave wings have ten primaries; their tails are very short and composed of soft feathers; the small hind toe is elevated above the three anterior ones when it is present, but in some species it is absent. The plumage is generally brown, varying from rufous to slaty according to the species, often more or less barred with dark brown or black, sometimes decidedly lighter, or even white, on the throat or underparts.

Tinamous are mainly terrestrial in their habits, some frequenting forests and others open plains. They run swiftly and fly strongly and fast. Their food consists mainly of seeds, berries, roots, etc., varied with spiders and insects. The nest is a hollow on the ground beneath a bush, scantily lined with leaves or herbage. The eggs, which vary in number from four or five to sixteen, have a wonderfully smooth shell, looking as if it were of burnished metal or glazed porcelain. In colour they vary greatly according to the species, primrose-yellow, sage-green, dark-blue, wine-purple, reddish-chocolate and pinkish-orange being some of the shades displayed. The sexes are alike, but the male undertakes the incubation of the eggs. The chicks are covered with buffish or chestnut down, often with black or white markings, and run as soon as they are hatched.

1 EOGNATHAE

Order SPHENISCIFORMES (Penguins)

The Order Sphenisciformes includes two families. One of these, *Family Cladornithidae*, contains only a fossil bird, *Cladornis pachypus*, from Miocene deposits in Patagonia. The other, *Family Spheniscidae* (Penguins), contains seventeen species of flightless, marine birds, peculiar to the southern



[Central Press.

ADELIE PENGUINS (*Pygoscelis adeliae*).
The young bird helps itself to shrimps from the throat of its parent.

hemisphere. They are stout-bodied, short-necked birds of moderate or large size. Their bills are stout, and covered with several separate horny plates, instead of a single sheath on each mandible as in most other birds. Their wings, generally termed 'flippers,' are used only for swimming, and are covered all over with small, scale-like feathers, there being no specially-developed quill-feathers. Their tails are usually very short. Their short, stout legs are set very far back, so that they stand or walk in an upright

AVES (ORDER SPHENISCIFORMES)

position when on land, and their three front toes are united by webs, the hind toe being very small.

Penguins are the most completely marine of all birds, travelling swiftly beneath the water by the use of their flippers, and emerging for brief periods to breathe. When at the surface, they swim very low in the water so that only the head and back are exposed. They feed almost entirely on fish, cuttle-fish and crustacea. They are sociable birds, both when at sea and when breeding. For the latter purpose they come ashore on islands or desolate coasts and hop, run, waddle or scramble over rocks, and even up steep hillsides, to their breeding grounds or "rookeries." Most of the species construct a slight nest of bits of grass or weeds in cavities between rocks, caves or burrows, but some of the larger forms select a slight hollow and line it with stones. They lay one, two, or occasionally three, eggs either nearly spherical or pear-shaped and with a white, chalky shell. The young, when hatched, are densely covered with down, which is replaced by feathers before they venture into the sea. The voices of Penguins are loud and harsh, and some species utter a bray which has earned them the name of "Jackass." They are particularly noisy when congregated on their rookeries.

All the species are bluish-grey or blackish above and white below, but they differ in the arrangement of black and white on the face and throat, and some have orange or yellow patches on the sides of the neck, whilst others have crests of long, yellow feathers on each side of the head.

The King Penguin (*Aptenodytes patagonica*) is a large species about three feet in length, with a long, rather slender bill, and with patches of orange-yellow on the sides and front of the neck. It breeds on sub-antarctic islands of the South Atlantic and Indian Oceans. It incubates its single

egg whilst standing in an upright position, the egg being held in a fold of skin between the legs.

The Jackass or Cape Penguin (*Spheniscus demersus*), about two feet long, has a rather stout bill and patches of black and white on the face. It frequents the shores of South Africa, breeding on various small islands off the coast. It is of some importance as a producer of guano, and its eggs are collected for sale under Government regulation.



By courtesy of [Carl Hagenbeck's Tierpark, Stellingen.]
KING PENGUINS (*Aptenodytes patagonica*).
These birds stand nearly three feet high and breed on sub-antarctic islands.

DIVERS (COLYMBIDAE)



[Arthur Brook]

BLACK-THROATED DIVER (*Colymbus arcticus*).

The larger of the two species of Diver which breed in Britain, here seen on its nest in Caithness.

Order COLYMBIFORMES (Divers)

This Order contains a single family, *Colymbidae*, including four species. They inhabit the northern portions of the northern hemisphere, frequenting sea-coasts, lakes and rivers. The bill is strong, compressed and pointed; the head large; the neck fairly long and the body long, large and heavy. The wing is short, narrow and pointed, having eleven primaries, and the tail is very short. The legs are placed far back and are short and remarkably flattened; the three front toes are large and connected by webs, whilst the hind toe is small.

Divers feed almost entirely on fish, which they obtain by pursuing them under water, propelling themselves by their feet. In winter they frequent the sea near the coasts, but in the breeding season visit inland lakes and pools on moors and tundras. They lay two oily-brown eggs, spotted and blotched with grey and black, in a depression close to the water's edge; and the downy chicks, when hatched, immediately take to the water, swimming and diving readily. When at sea, Divers are almost silent, but during the breeding season they utter extraordinary loud, laughing calls. Their flight is swift but laboured, but on land they shuffle along with difficulty and cannot stand up on their legs.

The Great Northern Diver or Loon (*Colymbus immer*) breeds in North America from the northern United States to the Arctic regions and in Greenland and Iceland. In winter it occurs on both coasts of North America and the coasts of Europe, south sometimes to Lower California, the Gulf of Mexico and the Mediterranean. It is not uncommon in winter round the British Isles. In winter the feathers of the upper parts are blackish margined with grey and the underparts are white; but in breeding plumage, the head, neck and upper parts are glossy black, with white streaks on the throat and sides of the neck, and white spots and bars on the back, wings and sides.

AVES (ORDER PODICIPIFORMES)

The Black-throated Diver (*C. arcticus*), somewhat smaller than the preceding, breeds on lakes in arctic North America, Siberia and northern Europe, including the Highlands of Scotland. In winter plumage it closely resembles the Great Northern Diver, but in summer the crown and hind-neck are ashy-grey, the upper parts black, barred and spotted with white, the throat purplish-black, the sides of the neck striped with black and white and the underparts white.

The Red-throated Diver (*C. stellatus*) is the smallest member of the family and has a more slender bill than the other species, somewhat upturned. In breeding plumage the crown and nape are slate-grey, streaked with



[G. K. Yeates.

LITTLE GREBE OR DABCHICK (*Podiceps ruficollis*).
Uncovering its eggs.

white, the upper parts are brownish, there is a patch of chestnut red on the throat, and the underparts are white. In winter the brownish upper parts are spotted with white and the throat is white like the underparts. This bird breeds in the northern parts of America, Asia and Europe, including Scotland and northern Ireland, usually nesting by small moorland pools and hill-lochs. In winter it is plentiful off the coasts of the British Isles and ranges south to the Mediterranean, Caspian Sea, South China, California and Florida.

Order PODICIPIFORMES (Grebes)

The Grebes include only a single family, the *Podicipidae*, containing eighteen species of water-birds distributed over the world. They have rather long necks; short, concave wings with twelve primaries; no true tail-feathers; and short legs placed very far back. The leg is extraordinarily flattened; the three front toes are independently lobed with fringing membranes, and have broad, flat claws; whilst the hind toe is extremely small. The sexes are similar and the plumage is usually dusky brown or

GREBES (PODICIPIDAE)

blackish-grey above, silvery below, with some white in the wings. Many species have ornamental tufts of feathers on the head, and the head and neck are frequently marked with patches of chestnut, yellow and black.

Grebes frequent lakes, rivers and ponds during the breeding season, but in winter are often met with on estuaries or the sea near the coast. They feed on fish, small aquatic animals and vegetable matter, obtaining their food by diving, using their feet alone to propel them under water. The nest is a pile of aquatic plants, generally half submerged in the water, anchored by attachment to reeds or other plants. The three to six eggs are white with a smooth, chalky covering and are covered by wet weeds whenever the parent leaves the nest. The chicks are covered with down, often strikingly striped, and swim and dive freely almost directly they are hatched.

The Great Crested Grebe (*Podiceps cristatus*) is found in suitable situations in Europe, Africa, Asia, Australia and New Zealand. In the British Isles it has greatly increased in numbers in recent years and has spread northwards. It is the largest member of the



ARTHUR BROOK.
GREAT CRESTED GREBE (*Podiceps cristatus*).
This striking bird has become much commoner in Britain in recent years.

family in the eastern hemisphere and has a long, slender neck. In breeding plumage both sexes have a tuft of elongated brown feathers on each side of the head and round the neck a ruff or tippet, which is chestnut with black edges.

The Red-necked or Holboell's Grebe (*Podiceps griseigena*), somewhat smaller than the preceding species, with a stout bill, breeds in the north temperate portions of Europe, Asia and North America, though not in the British Isles. In summer the crown and back of the neck are blackish, the cheeks and throat silvery-grey and the front of the neck chestnut red; the upper parts are dark brown, except for a conspicuous white patch

AVES (ORDER PODICIPIFORMES)

on the wing. In winter the birds are mostly found on sea-coasts and are not uncommon on the east coast of Britain, more rarely on inland waters and the west and south coasts.

The Horned or Slavonian Grebe (*Podiceps auritus*) is a comparatively small species which breeds in subarctic regions of North America, Siberia

and Europe, including the Highlands of Scotland, migrating south in winter. In breeding plumage the head and a ruff round the upper neck are black, with a tuft of orange-chestnut feathers on each side of the crown, the neck, breast and flanks are chestnut.

The Eared or Black-necked Grebe (*Podiceps nigricollis*), not much larger than the Little Grebe, breeds in many parts of Europe, western and central Asia, Africa and western North America. It has at times nested in various localities in England, Wales, Ireland and southern Scotland, sometimes in considerable colonies. In breeding plumage the head and neck are black, with a golden chestnut coloured tuft of long, hair-like feathers on each side of the head.



BLACK-BROWED ALBATROSS (*Diomedea melanophrys*).
In the act of checking its gliding flight in order to descend to the water for food.

The Little Grebe or Dabchick (*Podiceps ruficollis*), the smallest member of the family, is found on ponds and streams in Europe, Africa, Asia and Australia. In breeding plumage it is blackish-brown above, reddish - chestnut on the cheeks, throat and neck, and greyish - white below.

Order PROCELLARIIFORMES (Petrels and Albatrosses)

This Order contains about one hundred species of oceanic birds distributed over all seas. Its members are characterized by the form of their external nostrils, which are more or less tubular, the tubes sometimes uniting on the upper part of the bill, sometimes opening independently at the sides. The horny covering of the bill is more or less divided into separate scutes, and the bill is usually hooked at the tip. The wings are long and have ten primaries developed. The feet have the three front toes united by webs and the hind toe small or absent. The plumage in all the species has a peculiar, strong, musky smell. All lay only a single, white egg. The chick is covered with down and remains a very long time in the nest.

Diomedidae (Albatrosses). This family contains fourteen species of large sea-birds found in the southern oceans south of the tropic of Capricorn, and in the tropical and north Pacific Ocean. They have stout, hooked bills covered with a number of distinct horny plates, the nostril openings forming short tubes on each side of the middle plate of the upper mandible. They have rather large heads, somewhat elongated necks, stout bodies, and very long, narrow wings. Their legs are short and placed rather far back, their plumage is either brown, black and white, or almost completely white.

A great part of the life of an Albatross is spent in the air, gliding over the waves with its narrow, pointed wings held almost motionless, commonly many miles from land. The birds usually rise in a slanting direction against the wind, then make a turn in a large circle during which one wing points downwards, the other upwards, and finally make a rapid descent down wind. When the wind drops, they begin to flap their wings much more frequently. They feed chiefly on cuttle-fish, also eating fish and other marine animals and refuse floating on the surface. They breed in colonies on remote oceanic islands and when on land walk with a waddling gait. The nest is a depression in the ground or a hollow on the top of a mound of grass, moss and trampled earth. The single white egg, usually marked with some reddish spots or blotches, is somewhat pear-shaped. The young are fed by their parents on food regurgitated from the stomach, for many weeks, and become extremely fat. They remain in the nest for a further period while their down is being replaced by feathers, living at the expense of the accumulated fat.

The Wandering Albatross (*Diomedea exulans*), found throughout the southern ocean, chiefly between 60° S. and 30° S., is the largest ocean bird. Its body is as large as that of a Goose and the span of its wings is from ten feet to eleven feet six inches, occasionally reaching fourteen feet. Its plumage, when adult, is mainly white, with black tips to the primaries, and with some feathers on the back and sides freckled with narrow zig-zag, dark cross-bars. The immature bird is mainly brown with white face,

AVES (ORDER PROCELLARIIFORMES)



[T. M. Fowler.]

FULMAR PETREL (*Fulmarus glacialis*).

Formerly only breeding in the British Isles at St Kilda, the Fulmar now nests on cliffs throughout the northern parts of Britain. Here it is in an unusual situation on the roof of a crofter's hut.

throat and under-surface of the wings. It breeds on various islands in the South Atlantic, South Indian Ocean and New Zealand seas.

Procellariidae (*Petrels, Shearwaters and Fulmars*). This family includes over fifty species of sea-birds distributed over all the oceans. They vary in size from the little Whale-birds or Prions, about the size of Starlings, to the Giant Petrel (*Ossifraga gigantea*), as big as a Goose, and show much diversity of plumage, though in structure and habits they are very uniform. The bill is hooked at the tip, and somewhat compressed at the base, with the nostrils opening together at the end of a double tube on the upper mandible. The wings are long, and the legs rather short. The birds have a characteristic gliding flight, alternating with periods of flapping, and often skim close over the crests of the waves. Except when breeding, they spend all their lives at sea, feeding on small fish, squids, crustacea and other floating or surface-living animals. They are more or less sociable when at sea and often congregate in vast numbers to breed. For this purpose, they resort to islands or in a few instances to cliffs on the mainland. The majority excavate a burrow or utilize a cavity under rocks or bushes, but a few nest on ledges of cliffs, and the Giant Petrel lays its egg on the ground in the open. The young are densely covered with down and become very fat, and in this stage some species are collected for food, notably the Mutton-bird of the islands of Bass Strait.

The Manx Shearwater (*Puffinus puffinus*) breeds on islets in the North Atlantic and Mediterranean, from Iceland, Bermuda and Madeira to the

PETRELS, SHEARWATERS AND FULMARS

Aegean, large colonies being found on various islands off the coasts of Scotland, Wales and Ireland, though it does not now occur on the Calf of Man, from which its trivial name was derived. It is sooty-brown or blackish above and white below, with dusky patches on the sides of the neck and flanks.

The Great Shearwater (*Puffinus gravis*) is only known to breed at Tristan d'Acunha, but ranges over the Atlantic Ocean, migrating in the southern winter north to the Newfoundland Banks, the British Isles and even to the Arctic Circle. It is considerably larger than the Manx Shearwater and has the crown and nape and the mantle ashy-brown, the wing-quills and tail-feathers blackish, the underparts, back of neck and some of the upper tail-coverts white.

The Sooty Shearwater (*Puffinus griseus*) has the whole plumage dusky, brownish above and greyish below. It breeds in great numbers round New Zealand and near Cape Horn and in the southern winter ranges in flocks into the North Pacific and North Atlantic, frequently appearing off the coasts of the British Isles.

The Fulmar (*Fulmarus glacialis*) is in size and appearance decidedly like a small gull, the mantle, wings and tail being brownish-grey, the rest of the plumage white. The species is, however, dimorphic, and individuals occur in which the upper parts are darker than in the normal form, whilst



[Otto Webb.]

WEDGE-TAILED SHEARWATER (*Puffinus pacificus*).
A species widely distributed in the Indian and Pacific oceans, only coming ashore by night to its breeding hole.

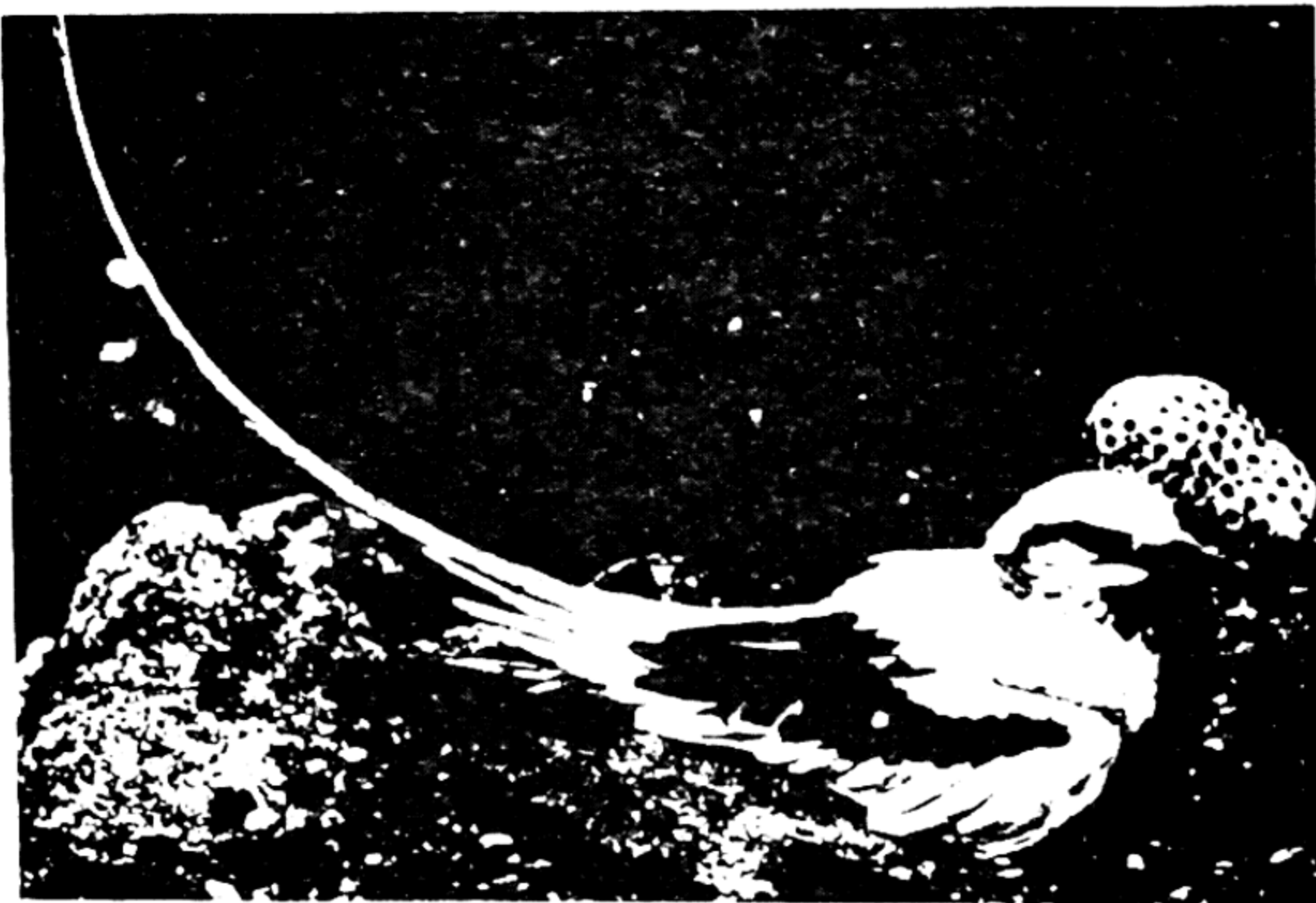
AVES (ORDER PROCELLARIIFORMES)

the head and underparts are brownish-grey. Such dark individuals are much more abundant in some parts of its range than in others, and are very rare in British seas. The Fulmar breeds in vast numbers on ledges of cliffs in far northern latitudes on the coasts of the North Pacific and North Atlantic, and it has been suggested that it is the most numerous of all species of birds. From the earliest times until 1878, the only breeding place of the Fulmar in the British Isles was the St. Kilda group; in 1878 it colonized Foula in the Shetlands, and during the next twenty years spread throughout that group. In 1897 it first bred on the mainland of Great Britain at Cape Wrath and in 1910 colonized Horn Head, Donegal, Ireland. It now breeds as far south as Flamborough Head, Yorkshire, and the Skelligs off the coast of Kerry, South-West Ireland, and has appeared at the Stack Rocks near Pembroke, South Wales.

Hydrobatidae (*Storm-petrels*). This family includes about twenty species of small sea-birds, distributed over the oceans of both hemispheres, often known as "Mother Carey's Chickens." They have rather slender, hooked beaks, on the upper surface of which the nostrils open within a single median tube. Their wings are fairly long and their tails either square or forked. Their slender legs are frequently very long in proportion to the size of the bird. The majority have dusky plumage, but a few are grey; many have a patch of white at the base of the tail and some have white areas on the under-surface.

These little birds flit over the waves with swift but erratic flight; when feeding, or in calm weather, they frequently assist their progress by patting the water with their feet, supporting the supposed origin of their name from

St. Peter, who walked on the water. Their food consists of small organisms picked up on the surface of the sea. They breed in burrows excavated in soft soil, or beneath matted vegetation, or utilize natural cavities among rocks, almost always on small islands. The single white egg is frequently



[Dr. F. Barns.]

WHITE-TAILED TROPIC BIRD (*Phaethon lepturus*).
Tropic Birds are often called "Bo'son birds" by sailors because they carry a marine spike on the tail.

PETRELS

marked with small red, purple or black spots. The young bird is densely covered with grey or brownish down. When full-fed it is considerably larger than its parents, which then leave it, and when the feathers have replaced the down, the young fledgling follows them to sea.

The Stormy Petrel (*Hydrobates pelagicus*) breeds on islets in the eastern Atlantic from Iceland to Brittany, including many off the north and west coasts of Britain and Ireland, and also in the western Mediterranean. In winter it ranges south down both coasts of Africa. Its plumage is sooty black, except for a white patch at the base of the tail.

Leach's Fork-tailed Petrel (*Oceanodroma leucorhoa*) is similar in colouring but somewhat larger and with a strongly-forked tail. It breeds on various islands in the eastern North Pacific and the North Atlantic, including some in the Outer Hebrides and off the west coast of Ireland.

Pelecanoididae (Diving-petrels). There are five species of Diving-petrels, small sea-birds confined to the southern hemisphere. They are very similar in appearance, and superficially closely resemble the Little Auk, or Dovekie, of Arctic seas. Their bills are short and broad at the base; their necks short and stout; their wings comparatively small; and their legs short and placed far back. Their plumage is mainly black above and white below, and between the diverging sides of the lower mandible, they have a small pouch partly feathered. They are generally found near the coast in small flocks and obtain their food, which consists of small fishes, crustacea, etc., by diving, using their wings under water. They excavate burrows in the soil, or under rocks on islands, in which to deposit their egg; during the breeding season they are nocturnal in habits.



[James's Press.

DALMATIAN PELICAN (*Pelecanus crispus*).

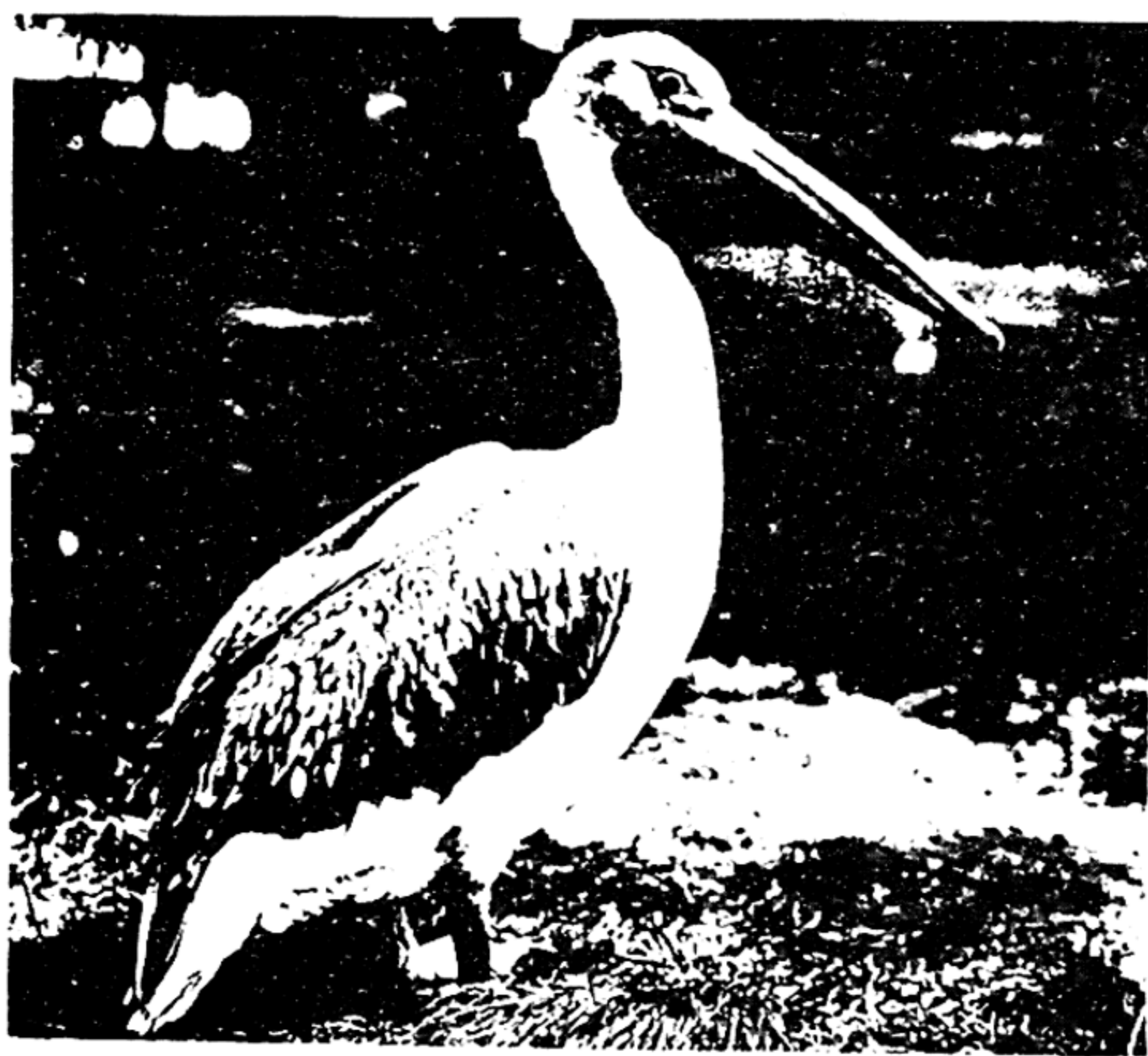
The range of this bird extends from S.E. Europe to China and in winter it visits Egypt and Northern India.

Order PELECANIFORMES (Frigate-birds, Cormorants, Darters,
Gannets, Pelicans and Tropic-birds)

This group consists of aquatic birds, mostly marine, of moderate or large size. They are very diverse in appearance, but agree in various structural features and differ from all other birds in having all four toes united by webs.

Odontopteryx toliapica, an extinct bird from the London Clay (Lower Eocene) beds of Sheppey, England, may be placed in this Order. The edges of its jaws were serrated, like those of certain Tortoises.

Phaëthontidae (*Tropic-birds*). This family contains three species of



EASTERN WHITE PELICAN (*Pelecanus onocrotalus*).
This species breeds on lakes in S.E. Europe, western Asia, and tropical Africa.

sea-birds almost confined to tropical coasts. They have straight, heavy beaks; long wings; wedge-shaped tails with the two central feathers enormously elongated in adults; and short legs. Their plumage is white, frequently more or less completely suffused with rosy or salmon colour, marked with black bars, often crescentic in form. Their bills are red or yellow, and in one species (*Phaëthon rubricauda*) the long streamers in the tail are red. These streamers are valued as

ornaments by the natives of the South Sea Islands, who obtain them by pulling them out of the tail of the sitting bird, which apparently suffers little inconvenience.

Tropic-birds frequent the high seas, flying with rapid wing-beats, usually at some height above the water, and plunging down on their prey, which consists mainly of fish and squids. They breed somewhat gregariously on rocky islands, laying a single egg on the ground under a bush or in a crevice. The egg is yellowish or reddish, thickly spotted with reddish-brown and blotched and streaked with purplish-black. The young are covered with thick white down.

Pelecanidae (*Pelicans*). This family contains eight species of very large water-birds distributed throughout the tropical and temperate regions of

PELICANS AND GANNETS

both hemispheres, with the exception of eastern South America, New Zealand and Oceania. Their bills are extremely large and a great distensible pouch is suspended from the lower mandible. They have fairly long necks ; heavy bodies ; broad, rounded wings ; rather short, rounded tails ; short legs and large feet. Their plumage is mainly white, grey or brownish, with the primaries usually black ; the great bill and pouch, and the naked areas of the face, are commonly yellowish or fleshy-pink. Most of the species frequent large freshwater lakes, lagoons and estuaries, also visiting sea-coasts, but on the coasts of the warmer parts of the American continent a species occurs which is entirely marine in its habits. This species obtains its food like Gannets, by diving down upon it from the air, feeding almost exclusively on fish. The remaining species have a more varied diet largely obtained in shallow water. Frequently, they form in line a short distance from the shore and by flapping their wings drive shoals of small fish into the shallows, where they are scooped up into their capacious pouches.

Pelicans are sociable birds, flying in flocks or feeding together. They have difficulty in rising from the water, flapping along the surface for a considerable distance, but when once fairly launched their flight is buoyant and strong. Sometimes they rise high into the air and soar round in circles on motionless wings. In flight, their heads are carried well back on their shoulders so that the large bill rests on the front of the neck. They nest in colonies, usually on islands, either in lakes or on the sea-coast. The nests are sometimes mere hollows, more often rough structures of sticks and weed-stalks on the ground, on a low bush or in a tree. The two to four large eggs are bluish-white with a chalky coating. The young are born naked and with quite short bills, but they soon become covered with white down and their bills enlarge rapidly. They are fed on partly-digested fish, which they obtain by thrusting their bill, and often also their whole head and neck, into the capacious pouch of the parent.

Pelagornis is a very large fossil bird, allied to Gannets and Pelicans, whose remains have been found in Miocene beds near Bordeaux, France. *Cyphornis magnus*, from Tertiary beds, probably of Miocene age, of Vancouver Island, and *Palaeochenoides mioceanus* from the Miocene of South Carolina, are known only from small portions of their skeletons, which resemble those of corresponding parts of Pelicans, but show certain resemblances to Gannets and more remotely to Cormorants and Darters. *Cyphornis*, if it was capable of flight, was larger than any existing flying bird, its leg-bone being twice as large as that of the largest Pelican.

Sulidae (*Gannets and Boobies*). In this family are nine species of large sea-birds found off the coasts of all the oceans except the North Pacific. They have stout, conical, pointed beaks ; fairly short necks ; stout bodies ; long wings ; long, wedge-shaped tails and short legs. Areas of the face and a small pouch on the throat are unfeathered. In most species the

AVES (ORDER PELECANIFORMES)

plumage of the adult is mainly white with black wing-quills, and in all, the immature birds have mottled brown plumage. They feed on fish, which they obtain by diving from the air and then pursuing them under water. They commonly dive from a height of about sixty feet, sometimes from as much as a hundred feet, above the surface and have been caught in fishermen's nets at a depth of ninety feet. They breed in colonies on oceanic islands or precipitous crags. The nests of some species are merely hollows in the ground or mounds of guano with a hollow at the top; others build rough nests of weeds or sticks either on the ground, on the ledge of a cliff or on a bush or tree. The one to three eggs have a pale blue shell,



[Gibson & Sons.]

COMMON CORMORANT (*Phalacrocorax carbo*).
Note the large sticks used in the construction of the untidy nest.

usually completely hidden by a white, chalky, surface layer. The chick when first hatched is naked, but soon becomes covered with white down. It is fed on partly-digested fish, to obtain which it thrusts its head and bill into the throat of the parent.

The Northern Gannet or Solan Goose (*Morus bassanus*) is an inhabitant of the North Atlantic and breeds in large colonies on islands off the coasts of the British Isles, Faroe Isles, Iceland, Labrador and Newfoundland and in the Gulf of St. Lawrence. The adult is mainly white with blackish primaries and the head and neck pale straw yellow; the young are dark greyish-brown spotted with white above, paler below.

Phalacrocoracidae (*Cormorants or Shags*). There are about thirty

CORMORANTS (PHALACROCORACIDAE)

species of Cormorants. They are large or moderate-sized aquatic birds, found on the coasts of all countries except the Central Pacific Islands. Many of the species also frequent lakes, rivers and estuaries. The bill is slender and terminates in a sharp hook; the neck is long; the wings and tails are rather long, the legs short and set far back, and the feet very large. The plumage is usually black, with green or purple gloss, sometimes white below; a number of species have crests in the breeding season. Parts of the face and a small pouch on the throat are devoid of feathers, and the naked skin is often brightly coloured. Cormorants feed on fish or crustacea, which they capture under water, swimming with their feet. They are frequently destructive to sporting fish in rivers and lakes, but in the sea they feed almost entirely on the slower-swimming fish that haunt rocks and weed-beds, and seldom capture the more active surface-swimming fish. After capturing a fish, a Cormorant has to bring it to the surface before swallowing it,

and this has probably led to their being trained by fishermen in India, China and Japan for the purpose of catching fish. A leather collar is put round the neck to prevent the bird from swallowing the fish.

Cormorants are sociable birds and mostly breed in colonies, placing their nests on the ground on low islands, on the ledges of cliffs, or in bushes or trees growing in swamps or lakes. The nests placed in trees or bushes, are composed mainly of sticks, but those by the sea are usually of seaweed and guano. Several species are of some importance as producers of guano,



(T. M. Fowler.)

NORTHERN GANNET (*Morus bassanus*).

The striking contrast between the white adult and the dark-plumaged young bird is here visible.

AVES (ORDER PELECANIFORMES)

particularly on the coasts of South Africa and Peru, and it has been claimed that the Guanay Cormorant of the Peruvian coast is the most valuable wild bird in the world. The eggs, two to six in number, are pale blue or pale green, but this colour is largely concealed by a white, limy covering. The young, when hatched, are naked; later they become covered with grey, brown or black down.



[W. S. Berridge.

GREAT FRIGATE-BIRD (*Fregata minor*).

The names Frigate-bird and Man-o'-War Hawk given to these birds indicate the ferocity with which they pursue other sea-birds and make them disgorge their prey.

They remain in the nest until they are fledged.

The Common Cormorant (*Phalacrocorax carbo*) inhabits the coasts, rivers and swamps of eastern North America, Europe, Africa, Asia, Australia and New Zealand. Its plumage is glossy greenish-black, with the chin and sides of the face white; immature birds, and adults of the African race, have the breast also white or whitish; in the breeding season adults have white patches on the flanks, and scattered white plumes on the head and neck.

The Green Cormorant or Shag (*Phalacrocorax aristotelis*) inhabits islands and rocky coasts of the eastern North Atlantic from Iceland and Norway to Morocco and of the Mediterranean from the Balearic Isles to Greece. It is generally more plentiful than the preceding species on the rocky



AMERICAN DARTER OR WATER TURKEY (*Anhinga anhinga*). [Neville Kingston.

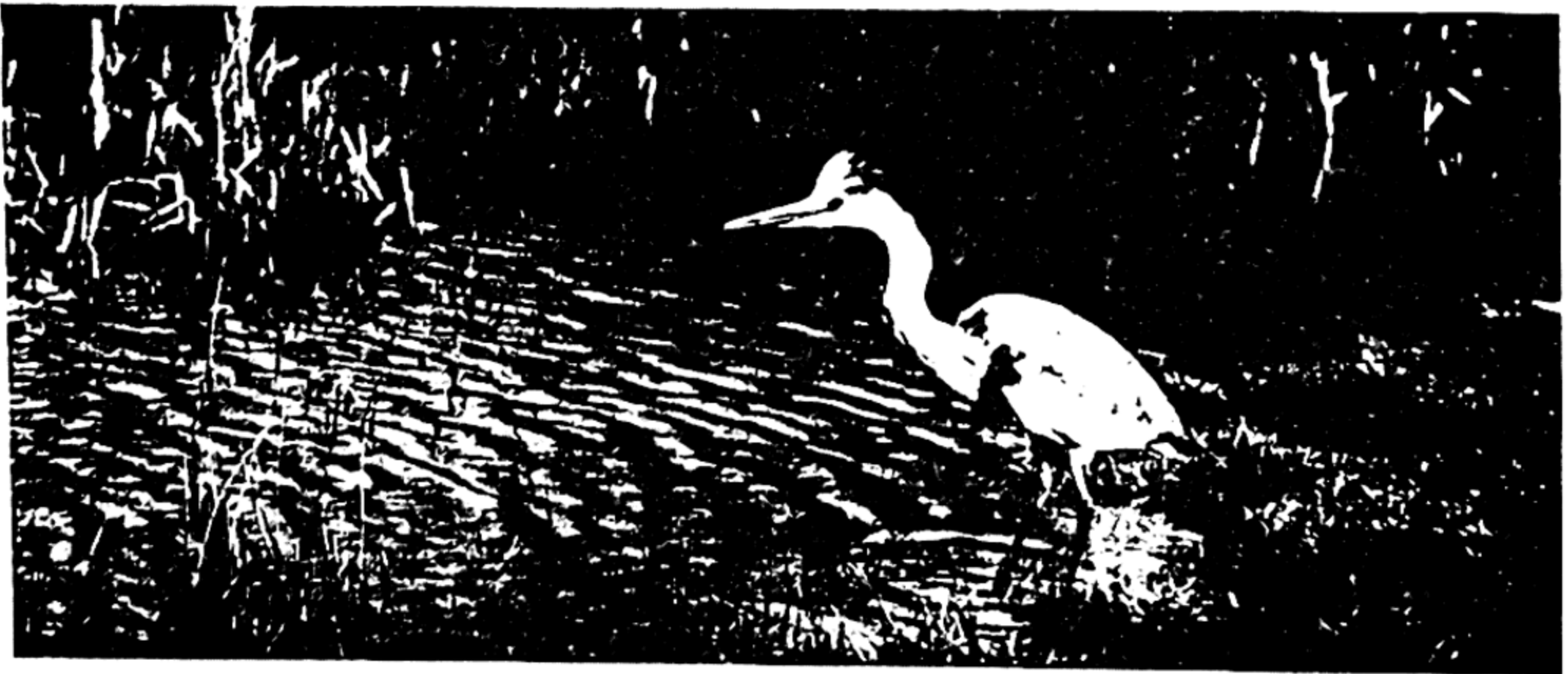
Note the kink in the neck which when suddenly straightened results in the darting forward of the dagger-like bill.

western coasts of the British Isles, and may be distinguished by its smaller size and glossy, greenish-black plumage. In the early months of the year it bears a crest of feathers curving forwards, but this is shed about June.

Anhingidae (*Darters*). This family includes four species found respectively in Africa, Southern Asia, Australia and tropical America. They have long, slender, sharp-pointed bills; small heads; very long, slender

DARTERS AND FRIGATE-BIRDS

necks ; large wings ; long tails ; short legs, and large, webbed feet. In the males the plumage is mainly glossy greenish-black, but in females it is brownish. Darters frequent large rivers, lakes, and lagoons, in which they pursue and spear fish beneath the water. For this operation their necks are specially adapted, as the vertebrae are so arranged as to give the neck a permanent kink, which can be momentarily straightened by the action of the muscles and results in the rapid forward thrust of the bill, from which the birds derive their name. When swimming at the surface, they normally have the whole body submerged, only the long, slender neck and head showing above the surface, and suggesting a snake ; hence they are commonly called "Snake-birds." The American form is also known as the "Water Turkey." Darters fly strongly, and are fond of sailing round in the air. They may also often be seen perched in trees overhanging the water. They build nests of sticks in colonies in trees near or



GREY HERON (*Ardea cinerea*).

[Kershaw.]

The largest resident British bird, formerly protected as the noblest game at which falcons were flown.

in the water, and lay four eggs with white, chalky shells. The young, when hatched, are naked, and already have very long necks.

Fregatidae (*Frigate-birds*). There are five species of these large, tropical sea-birds. They have long, slender bills with a sharp hook at the end ; short necks ; very long wings ; long, forked tails ; very short legs ; small feet, and four toes all united by webs at their bases. The plumage of adults is either entirely black, or black above with white areas below ; the young have white heads. Between the edges of the lower mandible, on the chin, there is a patch of naked skin ; in the males this forms a bright red pouch, which can be inflated to a very large size, and is the bird's chief ornament in the breeding season. Frigate-birds are the most completely aerial of water-birds, never settling on the water, or on a level coast, but remaining in the air throughout the day, sailing round on motionless wings, plunging down to the surface of the sea to pick up some floating object, or pursuing

AVES (ORDER CICONIIFORMES)

other sea-birds to make them disgorge their booty. At dusk they retire in companies to roost in some favourite clump of trees near the coast. In some of the Pacific Islands, they are domesticated, and are used like Pigeons for sending messages from one island to another. They breed in colonies on tropical islands, constructing large, clumsy nests of sticks, placed in trees, on bushes or on rocks. A single white egg is laid and the chick is entirely naked when hatched, but later acquires a covering of white down, which is soon replaced by feathers.

Order CICONIIFORMES (Hérons, Storks, Flamingoes)

This group contains a comparatively small number of species of wading birds with long necks and very long legs, mostly of large size. It is represented in all parts of the world.

Ardeidae (*Hérons and Bitterns*). This family contains about one hundred species of wading birds found almost throughout the world. Their bills are long, pointed, rounded above and compressed laterally; their necks are long; their bodies compressed and covered with loose feathers, which make them appear larger than their real size; their broad wings have eleven primaries; their tails are short; their legs are usually very long and their toes fairly long, the claw of the middle front toe being serrated. They feed largely on fish, frogs and crustacea, which are secured by a lightning-thrust downwards with the bill whilst standing in shallow water or wading slowly about. The Night-herons (*Nycticorax*) as their name implies are largely nocturnal, and Bitterns frequent reed-beds or



GREAT WHITE HERON (*Casmerodius albus*).

[Arthur Brook.

This fine bird, here seen at its nest in Hungary, is now very rare in Europe, owing to persecution and the drainage of the marshes.



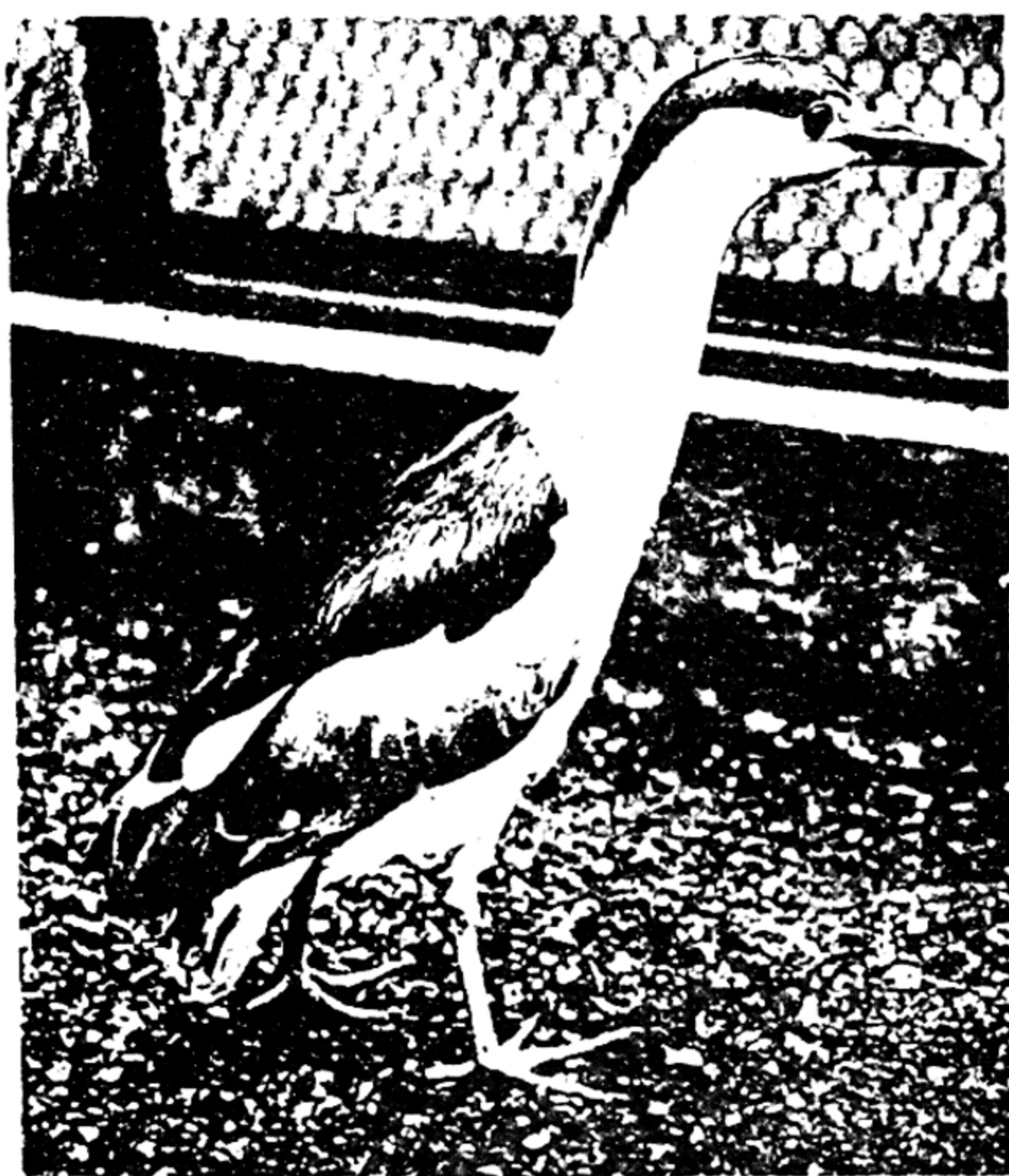
[Walter F. Higham

BITTERN (*Botaurus stellaris*).

The remarkable booming note of this bird is again to be heard on the Norfolk Broads.

AVES (ORDER CICONIIFORMES)

dense cover. When flying, the members of this family usually have the long neck curved in an S so that the beak alone is in advance of the breast, but the long legs are outstretched behind. Their notes are harsh croaks and hoarse squawks; whilst Bitterns also make loud booming calls. Their nests are large structures of sticks or reeds, either in trees, on bushes, cliffs or towers, or amongst the reeds in a swamp. The eggs are usually bluish or greenish, sometimes buff or white. The young, when hatched, have a scanty covering of down and remain for a long time in the nest until they



[D. Seth-Smith.
BLACK-CROWNED NIGHT HERON (*Nycticorax nycticorax*).
A nocturnal species found almost throughout the world, but only occasionally visiting the British Isles.

are fledged. In the breeding season, many species, especially the white ones known as Egrets, bear elegant soft plumes on the head, neck, breast or back. These are known in the millinery trade as "Ospreys" or "Aigrettes," but as their collection involves killing the parent birds at the nest, and leaving the young to starve, their import into most civilized countries, except France, is prohibited.

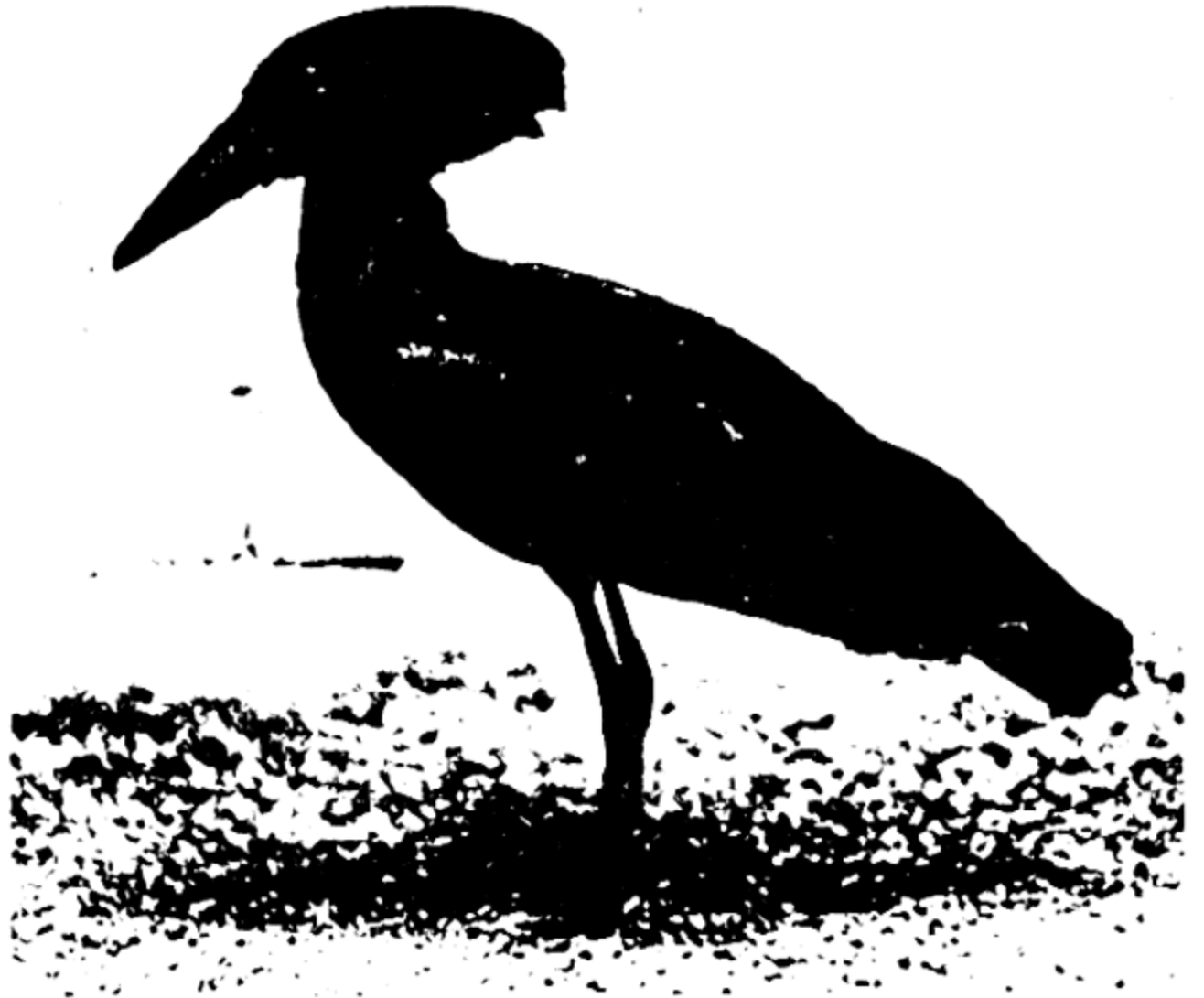
The Grey Heron (*Ardea cinerea*) is found over the greater part of Europe and Asia, birds from the colder regions visiting South Africa and India in winter. It is one of the largest members of the family and the largest common bird in the

British Isles. Its plumage is mainly grey, dark above and pale below, with the wing-quills and a patch on the shoulders black; the head and neck are mainly white, the former having a black crest and two long black feathers hanging from it down the back of the neck. The Heron was formerly protected in England, as being the noblest game at which Falcons were flown. Like many other members of the family, it nests in colonies, known as heronries, sometimes of very large size.

The Common Bittern (*Botaurus stellaris*) is found in reed-beds in many parts of Europe, Asia and Africa. Its plumage is chiefly buff, barred above and streaked below with black; the crown and nape are black. In the British Isles it became extinct in the middle of the 19th century, but since 1911 has re-established itself as a breeding species in Norfolk.

BOAT-BILLS AND SHOE-BILLS

Cochleariidae (*Boat-bills*). This contains only one species, found in Central and northern South America. In most structural features it resembles the Herons, particularly the Night-herons, but the long bill is very broad and flattened and the upper mandible is deeply grooved on each side of a central keel. Boat-bills frequent mangrove swamps and are nocturnal in habits. Their plumage is mainly grey with black on the back and flanks, white on the forehead and some rufous



[W. S. Berridge.
HAMMER-HEAD (*Scopus umbretta*).
The enormous roofed nests of these birds are a feature of African scenery.



[Neville Kingston.
BOAT-BILL (*Cochlearius cochlearius*).
A nocturnal bird found in tropical America.

colour on the underparts. The head is adorned with a long drooping crest of blue-black feathers.

Balaenicipitidae. This family contains only the Shoe bill or Whale-headed Stork (*Balaeniceps rex*), an inhabitant of the swampy districts near the upper White Nile in the southern Sudan, and adjacent parts of Uganda and the Belgian Congo. It is a very large bird, standing five feet high, with long legs, and an extraordinary bill. This is flattened and swollen, and has a ridge along its upper surface terminating in a hook; from its shape are

AVES (ORDER CICONIIFORMES)



[D. Seth Smith.

SHOEBILL (*Balaciceps rex*).

This large bird, also called the Whale-headed Stork, inhabits the swamps of eastern tropical Africa.

derived the bird's various names, including the Arabic "A b u m a r k u b" (Father of a Shoe). Its plumage is brownish-grey, with blackish wings and tail, the bill being yellow with dusky mottlings. A crest of short feathers curling forward on the top of the head adds to its singular appearance. Its food consists of fish, frogs, snakes, molluscs and carrion. The nest is a scantily-lined hollow on the ground containing two to twelve chalky-white eggs.

Scopidae. The Scopidae include only the Hammer-head or Hammer-kop (*Scopus umbretta*) found throughout Africa south of the Sahara and also in Madagascar and south-west Arabia. It is a comparatively small Stork-like bird, no larger in body than a Raven, but with fairly long neck and legs. Its long, keeled, greatly-compressed bill has a small hook at the tip; the rounded wings have ten primaries; the feet have four long toes of which the middle and outer front ones are united by a small web at the base.

The plumage is almost uniformly dull brown, glossed with purple, but the tail is barred with black. A long crest on the back of the head, generally carried horizontally, accounts for its South African names. The Hammer-head frequents the neighbourhood of water and feeds on fish, reptiles, frogs, worms, molluscs and insects; in flight the neck is somewhat curved, but the legs are outstretched. Its nest is an enormous structure of sticks, roots, clay, etc., roofed over with a flat covering of sticks leaving an entrance at the side. It is usually placed in a tree, or

STORKS (CICONIIDAE)

occasionally on a rocky ledge or on the ground, and is used year after year. The three to five eggs are white.

Ciconiidae (Storks). There are about twenty species of Storks. They are very large, wading birds, including some of the largest birds capable of flight. They mostly have long, stout bills, either straight or slightly curved up or down; the head and neck are frequently partly naked; the wings are very large with eleven or twelve primaries; the short tail consists of twelve broad feathers; the front toes are usually short with flattened claws and are partially united by webs, whilst the hind toe is somewhat elevated. Storks occur in most parts of the world, but are absent from the greater part of North America and Australia, the Malay Archipelago and New Zealand. They feed on the ground or in marshes on fish, frogs, reptiles, insects, etc., in search of which they patrol fields, open country and swampy localities. On the wing they fly with neck and legs outstretched and sometimes rise to great heights and circle round in the air. At times they indulge in grotesque dances and make a loud clattering noise with the bill, but they are generally silent, being practically voiceless. Their nests are large structures of sticks, generally built in trees, but sometimes on cliffs or buildings. The three to six eggs are white and chalky, and the nestlings when hatched have very scanty



[James's Press.]

ADJUTANT (*Leptoptilos dubius*).

This large Stork is a well-known scavenger in Indian towns.

AVES (ORDER CICONIIFORMES)



[Keystone.]

MARABOU STORKS (*Leptoptilos crumeniferus*).

Feeding in company with vultures on a dead zebra in the African bush. The curious pouch on the front of the neck is not a receptacle for food as is commonly supposed.

down, but in a short time get a growth of longer and denser white or grey down.

The White Stork (*Ciconia ciconia*) has the plumage entirely white except on the wings, which are mainly black. Its bill and legs are red. It breeds in many parts of Europe, but not in the British Isles, where it is only an occasional visitor; it nests also in North Africa and many parts of Asia. It migrates for the winter to Africa and India. Where it is protected, it commonly breeds in towns on the roofs of houses, chimneys and towers or on wheels or baskets erected on poles for its use, but it also builds in trees.

The Adjutant (*Leptoptilos dubius*) is a very large Stork found in India, Burmah and the Malay Peninsula. Its whole head and neck are bare with a very few scattered, short hairs, the naked skin being yellowish-red mixed with flesh colour; a ruff of white feathers borders the upper part of the back; the plumage of the upper parts is slaty-black; the wing-quills are black; there is a silvery-grey band on each wing; the under parts are white; the bill is pale greenish and the legs greyish-white. From the front of the neck hangs a bare, fleshy, reddish pouch, sometimes sixteen inches or more long. It is connected with the nasal cavity and is not a receptacle for food as is commonly supposed. The Adjutant is largely a scavenger, feeding on carcasses in company with Vultures, and examining rubbish heaps and garbage dumps in Indian cities, but it also frequents

STORKS (CICONIIDAE)

ditches and pools, where it captures fish, frogs, etc. The "Marabou



[Sport & General.

WHITE STORKS (*Ciconia ciconia*).

A pair with their nest and young on a tower in a Bavarian village—a familiar sight in many parts of Germany.

feathers" of commerce are the under tail-coverts of this bird and related species.

AVES (ORDER CICONIIFORMES)

Threskiornithidae (Ibises and Spoonbills). This family contains about thirty species of large, wading birds found in most parts of the world except New Zealand. They have long bills, which in Ibises are nearly cylindrical and strongly curved downwards, whilst in Spoonbills they are flattened, narrowed in the middle and dilated at the end into a flat "spoon"; the fairly large wings have eleven primaries; there are twelve tail-feathers;



[D. Seth-Smith.]

SACRED IBIS (*Threskiornis aethiopica*).
Parent bird feeding its young. Note that the bills of the latter are straight, though in the adult bird they are strongly curved.

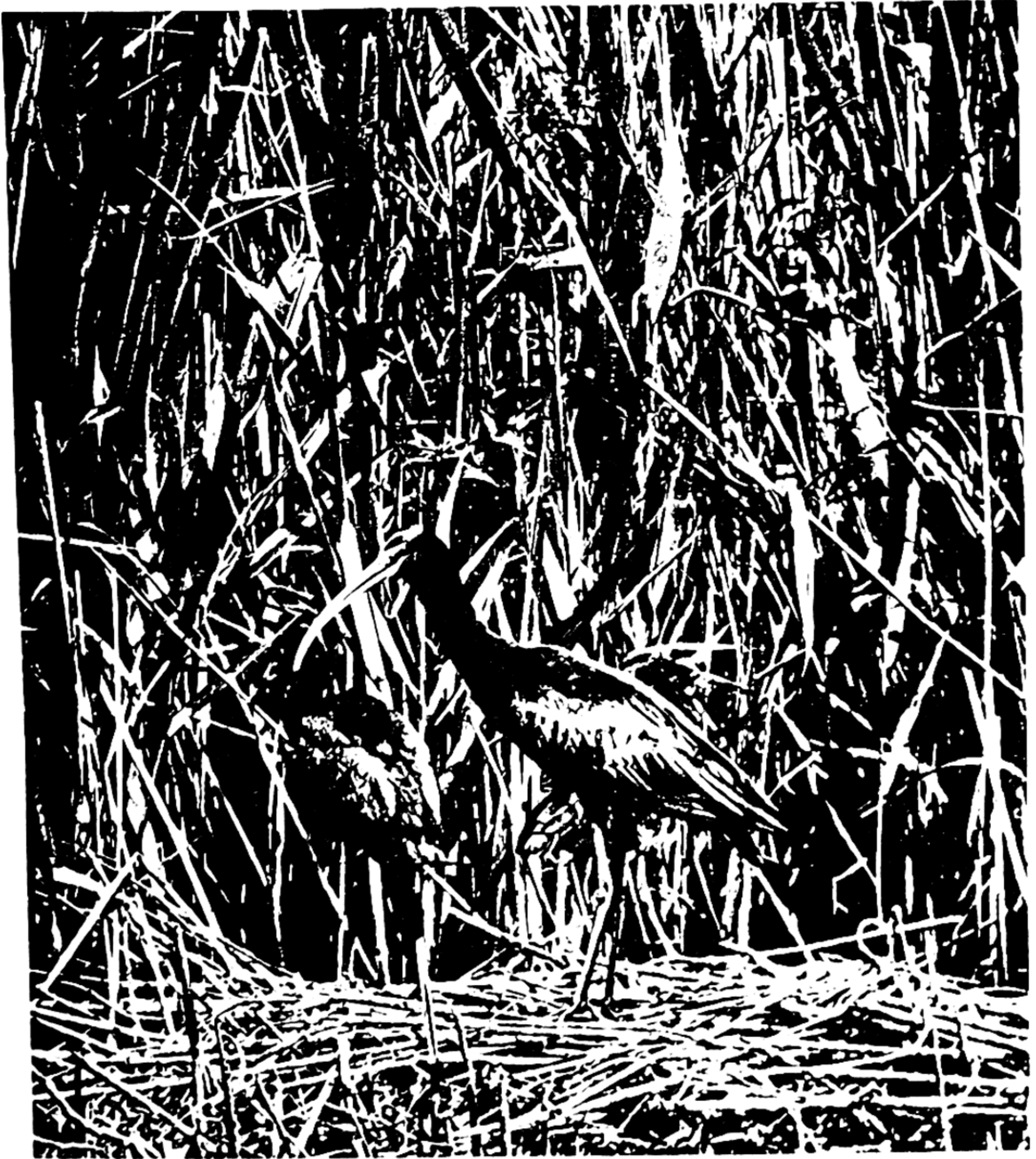
the legs are usually rather stout, and the toes are generally long, the three front ones being united by webs at the base. Spoonbills feed in shallow water, swinging the bill from side to side; some Ibises feed in the same way, but others probe soft ground for worms or pick up insects, frogs, etc., on the land. In flight, the neck and legs are carried outstretched. Most of the species are sociable and frequently associate with other species or with Herons and Egrets. The nest is sometimes among reeds or on ledges of cliffs, but more

often in bushes or trees, frequently in heronries or colonies of various species; it is a moderate or large structure of reeds or sticks. The eggs are from two to five in number, dull white, bluish or greenish, usually with reddish or brownish markings. The nestlings are covered with down, and when the nest is in a tree, remain in it until they are fledged, but when it is on the ground, they wander away from it earlier.

The Sacred Ibis (*Threskiornis aethiopica*) has the head and neck devoid of feathers, the naked skin being black; the plumage is white, except the

IBISES (THRESKIORNITHIDAE)

tips of the flight feathers, which are greenish-black, and the inner part of the wing, which is metallic purplish-black. It occurs throughout Africa, south of the Sahara, and in Madagascar, but is not now found in Egypt,



[Arthur Brook.]

GLOSSY IBIS (*Plegadis falcinellus*).

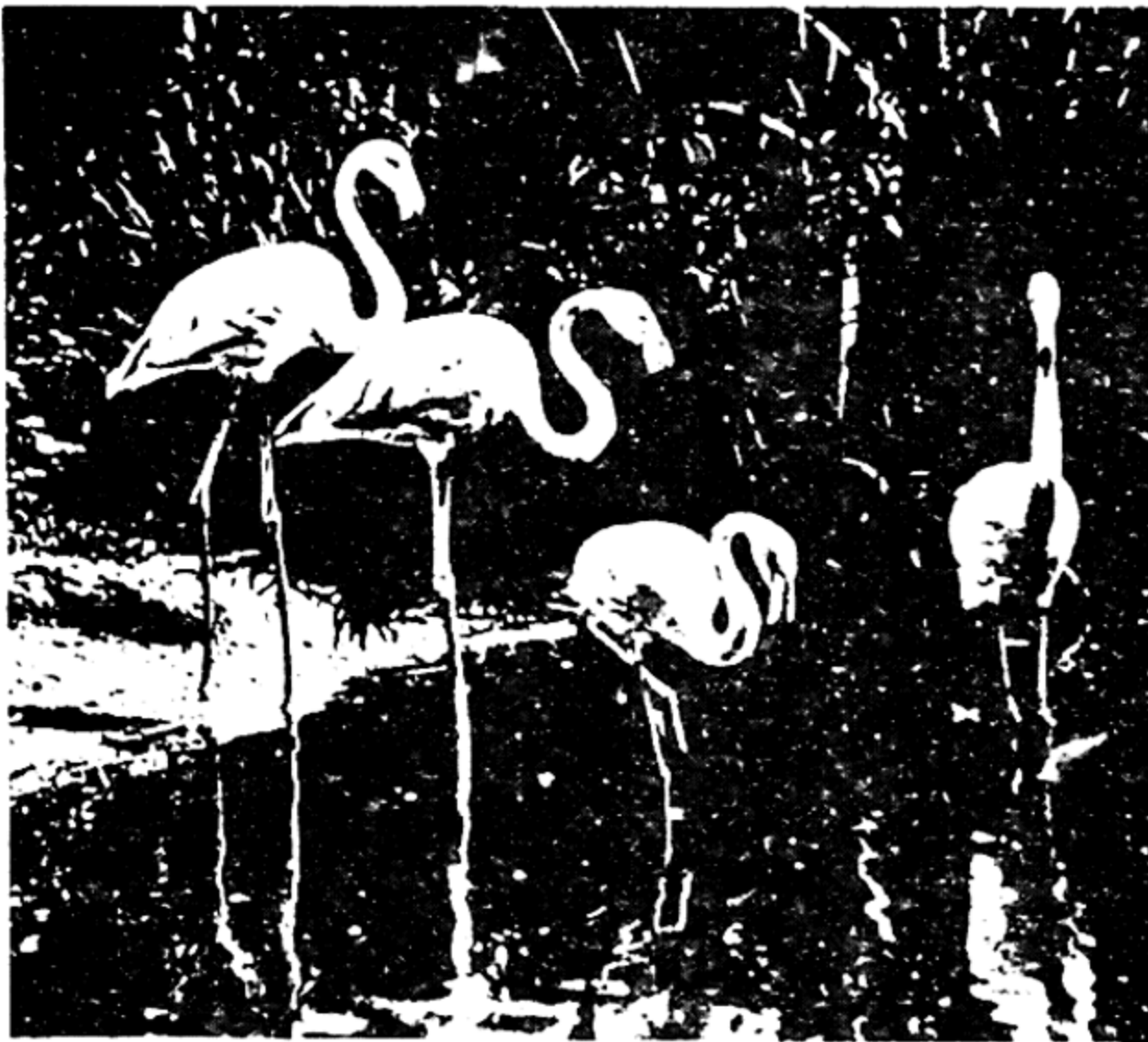
The only kind of Ibis that breeds in Europe, sometimes visiting the British Isles.

where in dynastic times it was common. It was an object of veneration, being regarded as intimately connected with the fertility of the Nile, and many mummies of this bird are in existence. The birds were quite common in the delta till 1800, but have not been observed there since 1876.

AVES (ORDER CICONIIFORMES)

The European Spoonbill (*Platalea leucorodia*) has the plumage entirely white in winter, but in the breeding season it has a long white crest tinged yellowish-buff and some yellowish-buff feathers at the base of the neck. The legs are black, the bill black with yellow tip and the naked skin of the throat yellow. It breeds in various parts of Europe, North-Eastern Africa and Asia, and winters in tropical Africa and Asia. It frequently visits the British Isles, where it nested in various localities until the 16th and 17th centuries, being then known as the "Popeler," "Shovelard" or "Shoveler."

Phoenicopteridae (*Flamingoes*). There are six species of Flamingo. They are found in Europe, Asia, Africa and Central and South America.

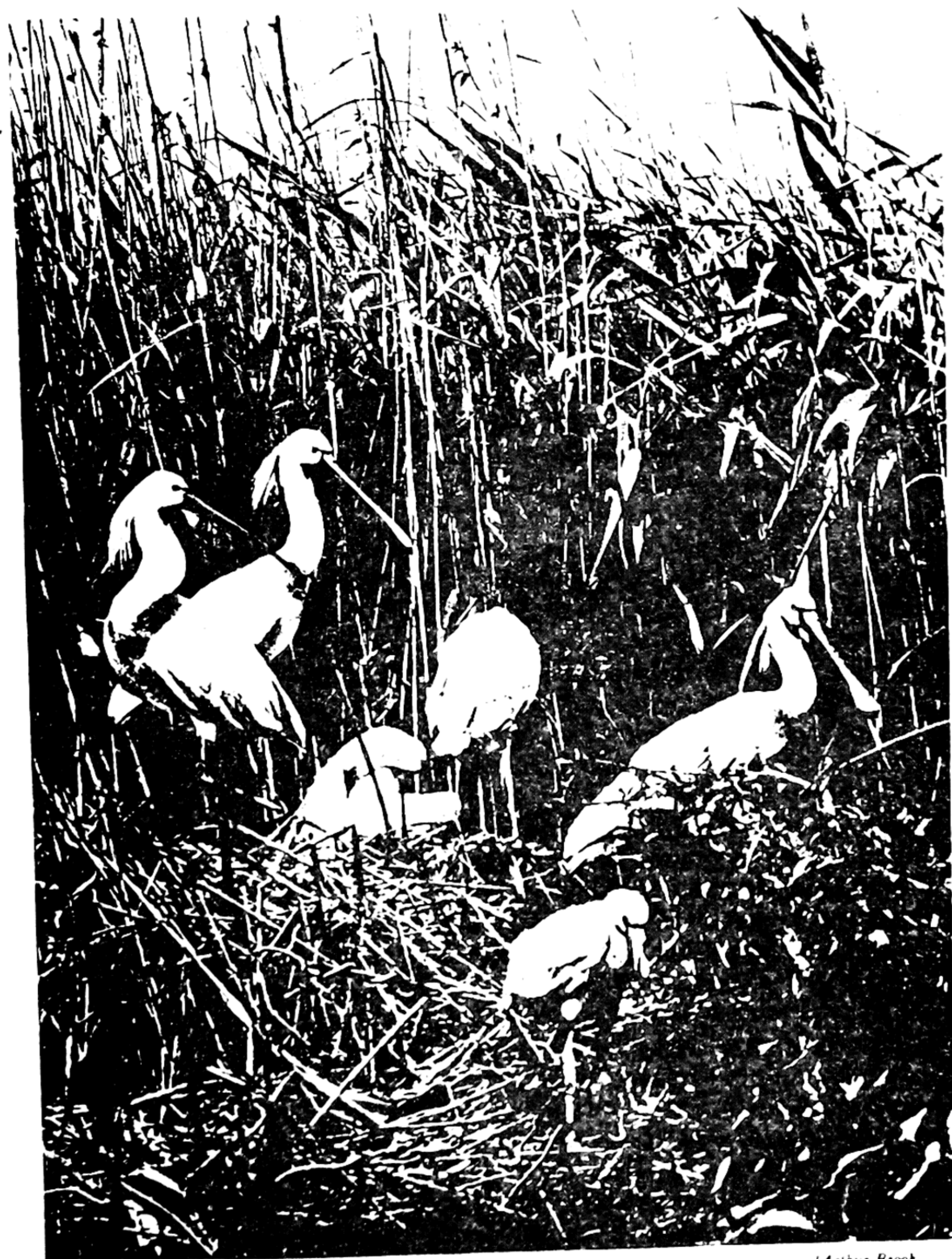


By courtesy of] [Carl Hagenbeck's Tierpark, Stellingen.
FLAMINGO (*Phoenicopterus antiquorum*).
These lovely birds, rosy pink with scarlet and black wings, have a unique method of feeding with the head upside down.

Flamingoes have small heads and very long, flexible necks; the very peculiar bill is abruptly bent down in the middle and high at the base, the lower jaw is large and almost immovable whilst the upper is smaller and freely movable, and both are fringed with transverse horny ridges as in Ducks; the large, fairly long wings have twelve primaries; the short tails have fourteen weak feathers; the legs are excessively long and slender, with unfeathered "thighs"; the feet have three short front toes united by webs, whilst the hind toe is either absent or small and

elevated. The plumage is pinkish-white or light scarlet with bright scarlet wing-coverts and black wing-quills.

Flamingoes are sociable birds, usually found in immense flocks wading in shallow lagoons or on the borders of salt lakes. Their method of feeding is peculiar, the head being held upside down with the bill pointing backwards immersed in the water. They fly with neck and legs outstretched, often in V-shaped formations, and like the Ducks, they moult all the wing-quills at the same time so that they are temporarily incapable of flight. The nests are mounds of mud with a slight hollow on the top, usually built in close proximity to one another in shallow water. The female lays one or two white eggs with chalky covering and sits on the nest with legs folded beneath her, not hanging down the sides or stretched out behind as was formerly believed. The nestlings, covered with white, woolly down, have short, straight bills and can run as soon as they are hatched.



[Arthur Brook.]

EUROPEAN SPOONBILL (*Platalea leucorodia*).
Part of a Hungarian breeding colony; three hundred years ago these birds nested in England.

Order ANSERIFORMES (Ducks, Geese, Swans and Screamers)

This Order contains only two families, the members of which are very different in external appearance, though agreeing in various anatomical features. Each family constitutes a suborder.

Suborder Anseres : Family *Anatidae* (Ducks, Geese and Swans).

Suborder Anhimae : Family *Anhimidae* (Screamers).

Anatidae (*Ducks, Geese and Swans*). This family contains many species of large or moderate-sized aquatic birds found in all parts of the world. They usually have small heads ; long necks (very long in Swans) : heavy bodies ; large, somewhat pointed wings ; short tails ; short stout legs set far back near the tail ; and feet in which the three front toes are united by webs, whilst the hind toe is small and elevated. The bill varies much in form, being long and wide in most Ducks, long and thin in Mergansers, and short and conical in Geese ; it is covered with a soft, sensitive membrane ending in a horny process called the " nail " ; in many species there is a series of ridges present on each side of each jaw, set transversely, and acting as strainers, whilst in Mergansers they point backwards and help to hold slippery fish. In Swans, most Geese and most of the Ducks found in the southern hemisphere, the sexes are similar in plumage. In most Ducks of the northern hemisphere, the males, or drakes, are much more brightly coloured than the females, or ducks. In these species the males take no part in incubation or the rearing of the family, but as soon as the female begins sitting, they leave her and moult into an " eclipse " plumage, which is usually very similar to that of the female. In all the members of this family, the wing-quills are moulted simultaneously so that for a short period the birds are incapable of flight. A feature of the plumage of many Ducks is a patch of brightly-coloured feathers, often with metallic sheen, on the wing, known as the " speculum."

Members of the family are found on the sea near the coast, as well as on lakes, rivers and ponds, whilst a few frequent mountain torrents. Swans and many Ducks feed mainly on aquatic plants which they obtain from the bottom in shallow water by immersing the head and neck and tilting the body so that the tail is raised vertically ; many Geese are even more completely vegetarian, leaving the water and browsing on grass or cultivated crops ; the Diving Ducks feed largely on mussels and other molluscs, for which they dive to considerable depths ; whilst the Mergansers feed principally on fish, which they pursue under water, propelled by their feet. Most of the members of the family fly swiftly, often in V's or wedge-shaped flocks, with the neck outstretched in front. During the winter they commonly associate in large flocks, and the species which breed in high latitudes migrate to spend that season in warmer climes where the water does not become frozen.

The nest is placed on the ground or in a hole, sometimes in a hole in a tree at a considerable height. It is lined with down from the body of

SWANS (ANATIDAE)

the parent. The eggs vary in number from two to twelve or more and are smooth and hard-shelled, white, creamy or greenish in colour. The young are covered with down and take to the water soon after hatching.

The birds of this family are much sought after by sportsmen, many of them being excellent for the

table, and most of them from their wariness and the rapidity of their flight providing excellent sport. Several have been domesticated and are familiar inhabitants of farmyards, whilst many others are kept in semi-domestication on ornamental waters in parks.

The Mute Swan (*Cygnus olor*) breeds in a wild state from Denmark and southern Scandinavia through Central and Eastern Europe to Turkestan and Mongolia, and winters round the Mediterranean and Caspian Seas and eastward to India. It was introduced into the British Isles and kept in semi-domestication at least as early as the 12th Century and is now familiar in all parts of the world. The plumage of the adult is pure white, with the bill orange and the face and knob above the base of the bill black. The young, known as cygnets, have grey plumage and black bills.

The Whooper or Wild Swan (*Cygnus cygnus*) breeds in northern Europe and Asia and winters in southern Europe and Central Asia. It is almost as large as the Mute Swan, but the neck is straighter, the bill is black at

the tip and yellow at the base, and there is no knob above it. It has a loud, trumpeting call.

Bewick's Swan (*Cygnus bewickii*), very similar to the Whooper, but smaller and with less yellow on the bill, breeds in northern Russia and Siberia and winters in the British Isles, northern Europe, central Asia, China and Japan.

The Black - necked



By courtesy of [Carl Hagenbeck's Tierpark, Stellingen.]
MUTE SWAN (*Cygnus olor*).
The male (or cob) on the left can be distinguished from the female (or pen) by the large knob above his bill.



[Otho Webb.]
BLACK SWAN (*Chenopsis atrata*).
The emblem of Western Australia, where it was discovered by a Dutch expedition in 1697.

AVES (ORDER ANSERIFORMES)

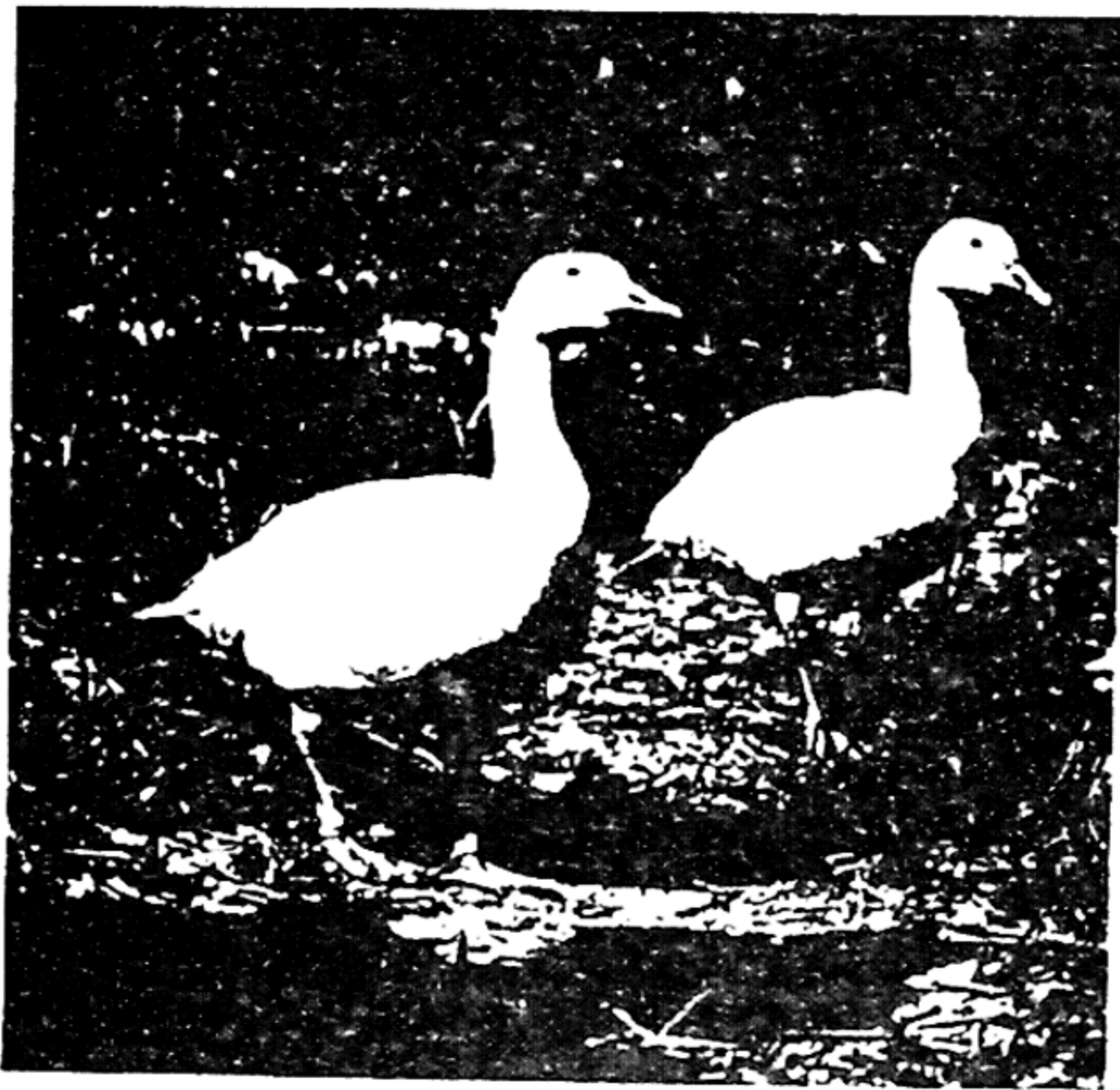
Swan (*Cygnus melancoriphus*) is a native of temperate South America and is frequently seen in captivity. It is much smaller than the Mute Swan and the plumage of its head and neck is black ; the bill is blue and the knob above it red.

The Black Swan (*Chenopsis atrata*) is a native of temperate Australia and Tasmania and has been completely acclimatized in New Zealand. It is frequently kept in confinement in other parts of the world. Its plumage generally is dull black, but the wing-quills are white and the beak bright red, with no knob at the base.

The Greylag Goose (*Anser anser*) is found in many parts of Europe and Asia, breeding in the more

northerly portions and migrating south for the winter. A few still breed in northern Scotland. It is the ancestor of the Domestic Goose and much resembles the familiar grey goose of farmyards, but is rather smaller.

The White-fronted Goose (*Anser albifrons*) breeds in the Arctic regions of both hemispheres and winters south to the British Isles, the Mediterranean, northern India, China, Japan, Mexico and Florida. It is smaller than the Greylag, with a white patch above the bill and black bars on the breast.



By courtesy of [Canadian National Railways.
SNOW GESE (*Chen hyperborea*)
These birds breed in Arctic America and probably also in Siberia,
and come south in winter, occasionally to Britain.

The Bean Goose (*Anser fabalis*) breeds in northern Siberia and winters south to the British Isles, the Mediterranean, Turkestan, China and Japan. It is as large as the Greylag but slimmer, with darker plumage and a longer bill.

The Pink-footed Goose (*Anser brachyrhynchus*), smaller than the Bean Goose, with a short bill, breeds in Iceland and Spitzbergen and winters in north-western Europe, principally on the east coast of Great Britain.

The Brent Goose (*Branta bernicla*) has the head, neck, breast and tail black, the upper parts brownish black, the underparts grey, the tail-coverts and a small patch on each side of the neck white. It is a small goose, largely maritime in habits, feeding principally on grass-wrack (*Zostera marina*) on mudflats at low tide. It breeds in the arctic regions of both hemispheres and winters on the temperate coasts of the North Atlantic and North Pacific.

GEESE AND DUCKS

The Barnacle Goose (*Branta leucopsis*), somewhat larger than the Brent, has the forehead, cheeks and chin white, the crown and neck black, the upper parts grey barred with black and white, the wing-quills and tail blackish, the breast greyish and the tail-coverts white. It breeds in Greenland and Spitzbergen and winters on the coasts of the British Isles, the North Sea and the Baltic.

The Canada Goose (*Branta canadensis*) is the familiar wild goose of North America, breeding in Alaska, Canada and the northern United States and migrating for the winter to the southern States. In the British Isles it is kept on lakes in many parks and in some districts may be

regarded as acclimatized. Its head and neck are mainly black, but the throat and a patch on each side of the head are white. The back and wings are greyish-brown, the tail black and underparts greyish-white.

The Muscovy Duck (*Cairina moschata*) is a native of tropical South America and was domesticated by the Indians before European settlement. It is frequently kept in poultry yards in other parts of the world. It is a long, low bird with short legs and glossy, greenish-black plumage with white patches in the wings. The male is much larger than the female and has the face bare, the naked skin being mottled black and red.

The Sheldrake (*Tadorna tadorna*) is found on the coasts of Europe and of the salt lakes of eastern and central Asia, migrating southward

in winter. The plumage in both sexes is mainly white, the head being greenish-black, the belly and tail black and a band round the breast and shoulders, chestnut. The bill is bright red and the legs pinkish red. It breeds in holes in sand-hills near the sea.

The Mallard or Common Wild Duck (*Anas platyrhynchos*) breeds in Europe, northern Asia and northern North America, and migrates south to North Africa, India, Central America and the West Indies. The male is pencilled grey with a brilliant green head, white collar and chestnut breast; the stern is black, with the black centre-feathers of the otherwise



By courtesy of Carl Hagenbeck's Tierpark, Stellingen.
ORINOCO GOOSE (*Neochen jubata*).
An inhabitant of the Amazon and Orinoco rivers and their tributaries.



(W. S. Burridge.)
EMPEROR GOOSE (*Phalacrocorax auritus*).
This handsome bird inhabits the countries on both sides of the Behring Sea.

AVES (ORDER ANSERIFORMES)

whitish tail curled up. The female is mottled brown. Both sexes have on the wing a metallic blue speculum with white edges, and bright orange legs. This species is the ancestor of the various breeds of domestic ducks, of which the Rouen resembles the wild bird in colouring, but is much larger and heavier. The Aylesbury is pure white and also larger than its wild ancestor. The Indian Runner is remarkable for the posterior position of its legs and consequently stands much more upright than other ducks.

The Gadwall (*Anas strepera*) breeds in Europe and Asia, from Iceland and the British Isles to Kamchatka, and in North America, and winters south to the tropics. The drake has the head greyish-brown, most of



By courtesy of Carl Hagenbeck's Tierpark, Stellingen.
GREYLAG GOOSE (*Anser anser*).
The ancestor of the domestic goose.

the plumage mottled and marbled with shades of grey, the rump and tail-coverts black, a chestnut patch and a white speculum on the wing. The duck is spotted and mottled with brown and has a white speculum.

The Wigeon (*Marca penelope*) is decidedly smaller than the Mallard. The male is pencilled grey with a chestnut head, cream-coloured forehead, white abdomen and black stern. The wings have a large white patch. The female is brown with white underparts. In summer it is found in northern Europe and Asia, migrating south

in winter to north Africa, India and China. In the British Isles it is plentiful in winter, and some breed in northern Scotland.

The Teal (*Anas crecca*) is the smallest species of duck, no larger than a pigeon. The plumage of the male is pencilled grey with a chestnut head, green band along the side of the head and cream and black stripes on each side of the back. The female is mottled brown. Both sexes have a bright green speculum. Teal are found throughout Europe, North Africa, Asia, North and Central America, breeding in the northerly portion of their range and wintering chiefly in the south.

The Garganey (*Anas querquedula*) is chiefly a summer visitor to Europe and northern Asia, breeding from Britain to Kamchatka, and winters in tropical Africa, India and the Malay region. The plumage of the drake exhibits various shades of brown, with a broad white stripe over the eye, elongated scapular plumes black with a median white stripe, wing-coverts bluish-grey and belly white. The duck is mottled brown and both sexes have the speculum green between two white bars.

DUCKS (ANATIDAE)

The Pintail (*Anas acuta*) has almost exactly the same geographical range as the Teal. It is a slender, graceful duck with long neck and tail. The male is pencilled grey with a brown head, white neck and underparts and black patches on the shoulders. The two central tail feathers, which are very long, are black. The female is mottled greyish-brown.

The Mandarin Duck (*Dendronessa galericulata*), a native of China and Japan, is often kept in confinement or semi-captivity on ponds. The male in full plumage is one of the most brilliantly-coloured birds. He has a large copper and green crest, an orange ruff on the neck, and the innermost



SHELDRAKE (*Tadorna tadorna*).

[Stanley Crook.]

A drake guarding chicks. In this species the male does not leave all family cares to his partner as do most male ducks.

wing-quills, which are also orange, greatly enlarged and forming a fan at each side. Above these the long shoulder-plumes are black and white. In addition, the breast is purple, a line above the eye and the belly are white and there are bright blue lines on the back and sides. The female is mottled brown with a white belly.

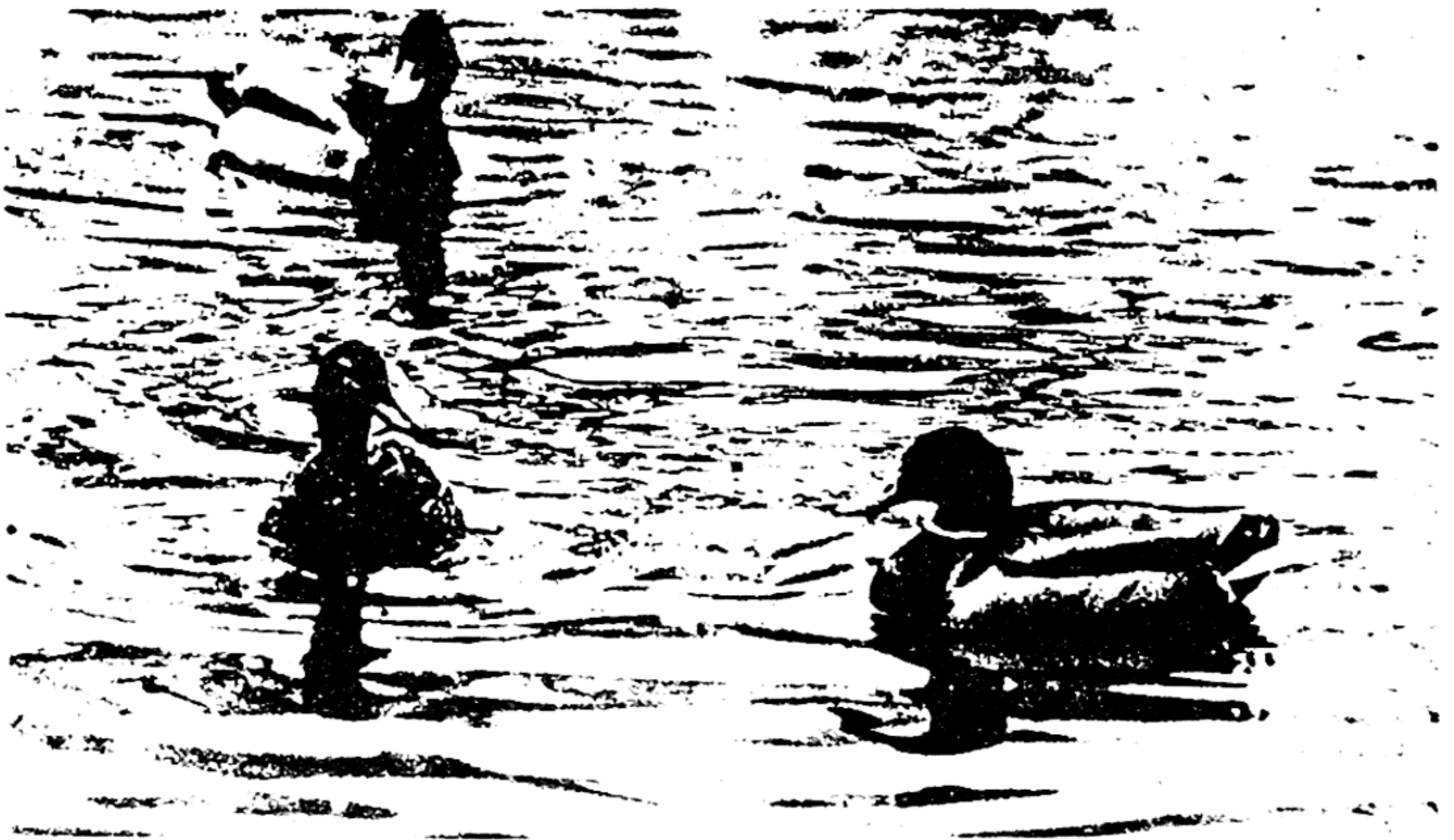
The Shoveler (*Spatula clypeata*) is remarkable for the great width of the tip of its long bill and the great development of the sifting-ridges at the sides. The male has the head green, the breast white and the underparts chestnut. The female is mottled brown. In both sexes the inner half of the wing is light blue and the speculum green. This species has

AVES (ORDER ANSERIFORMES)

a very wide range, which includes almost the whole northern hemisphere, and in winter it reaches Ceylon, Borneo and Colombia.

The Pochard (*Nyroca ferina*) is a diving duck distributed on lakes and ponds all over the northern parts of the eastern hemisphere. The male has the head chestnut, the breast and stern black and the rest of the body pencilled silvery-grey. The female is dull grey with a brown head and breast.

The Canvasback (*Nyroca valisineria*) is similar to the Pochard, but larger and with a long black bill. It feeds largely on the wild celery (*Vallisneria*) and this gives its flesh an excellent flavour, which makes it in great demand for the table. It is a native of North America.



MALLARD OR COMMON WILD DUCK (*Anas platyrhynchos*) ON THE DECOY POND. [G. K. Yeates.

The Tufted Duck (*Nyroca fuligula*) is found on lakes and ponds throughout Europe and northern Asia, and in winter reaches Abyssinia, India and the Malay Archipelago. The male is black, with white flanks and belly and a white bar in the wing, and has a tuft of elongated black feathers on the back of the head. The female has a shorter tuft and is blackish-brown with brown flanks, white belly and white wing bar. In recent years this species has increased remarkably in the British Isles, where it now breeds in almost all counties.

The Scaup Duck (*Nyroca marila*) is a northern species, breeding in high latitudes in both hemispheres and occasionally as far south as Scotland. The drake has the head, neck and breast black, the back white with fine wavy black cross-lines, the belly and a patch in the

DUCKS (ANATIDAE)

wing white, and the stern blackish-brown. The duck is brownish, nearly black on the head and neck, with a conspicuous white patch round the base of the bill. In winter the Scaup is chiefly a maritime species and occurs on the coasts of western Europe, the Mediterranean, Black Sea and Persian Gulf, the coasts of China and Japan and both coasts of the United States.



By courtesy of [Carl Hugenbeck's Tierpark, Stellingen.]
 CAROLINA DUCKS (*Aix sponsa*).
 These handsome birds, often kept on ornamental waters, are known in their native land, North America, as Wood Ducks or Summer Ducks.

The Goldeneye (*Bucephala clangula*) is found throughout the northern hemisphere. The male has a dark-green head with an oval white patch before the yellow eye; the back and wings are black, with white shoulder-streaks and wing-patch, and the underparts are white. The female is smaller with a dark brown head, white neck and underparts and dark grey upper parts.

The Long-tailed Duck or Old Squaw (*Clangula hyemalis*) has a circumpolar range in summer, and in winter moves south to the ice-free waters of northern Europe, Asia and North America, including the seas round Scotland and north-eastern England. The most striking feature of the species is the great elongation of the two central tail-feathers of the drake, whose plumage in winter is mainly black and white, but in summer largely brown.



[W. S. Berridge.]
 MANDARIN DUCKS (*Dendronessa galericulata*).
 The drake of this species is one of the most gorgeous of birds; the fans on his wings make him unique.

The Black Scoter (*Oidemia nigra*) breeds in the Arctic regions in the vicinity of freshwater lakes and swamps, and in winter is found on the coasts of the temperate parts of the northern hemisphere. It feeds almost solely on mussels, which it obtains by diving. The male is entirely black, the female greyish-brown with whitish cheeks and belly.

The Velvet or White-winged Scoter (*Melanitta fusca*) has much the

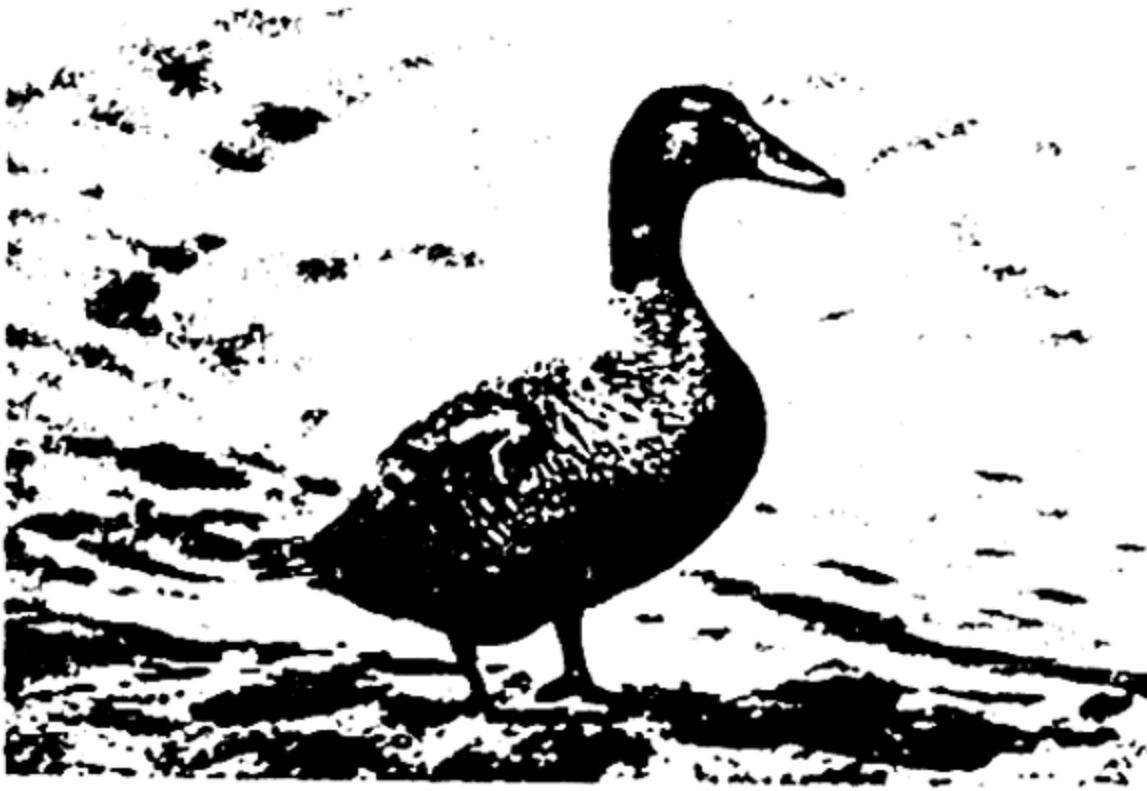
AVES (ORDER ANSERIFORMES)

same range as the Black Scoter, both in summer and winter, but on British coasts is much less numerous. It is a somewhat larger bird, with a conspicuous white patch in the wing.

The Eider (*Somateria mollissima*) is a large marine duck found on Arctic and northern coasts on both sides of the North Atlantic. The male has the upper parts mainly white, the top of the head, wing-quills, underparts and stern black, the breast pale buff and a band round the back of the head green. The female is entirely barred with brown. The nest is always close to the sea, and, as in other ducks, the female plucks down from her breast to line it and cover the eggs. The down in this species is very fine and elastic and is collected from the nest in Scandinavia and Iceland, where the birds are specially protected and breed in colonies.

The Steamer-duck or Loggerhead (*Tachyeres brachyptera*) is the largest of the diving ducks, the male having a very heavy body, as large as that

of a goose. In colour it is slate-grey with a white belly and wing-bar and an orange-yellow bill and feet. The smaller female is darker in colour. The wings are very small and the birds can fly only when quite young, soon becoming too heavy. The adults escape from danger by paddling along the surface of the water, flapping their wings. The Steamer-duck inhabits the Straits of Magellan, the coasts of Chile and Patagonia and the Falkland Isles.



[J. D. Rallier.
EIDER DUCK (*Somateria mollissima*).

The Goosander (*Mergus merganser*) is the largest of the saw-billed ducks, or Mergansers, which feed on fish. The male is mainly white, tinged with salmon-colour, with a green head, black on the back and wings and a grey tail. He has a short crest. The female has a chestnut head with a long straggling crest, grey upper parts and white underparts. Both sexes have long, slender red bills. This species is found all round the northern hemisphere, breeding in northern localities and in winter reaching North Africa, India, China, Mexico and Bermuda. In summer it frequents lakes and mountain torrents, but in winter is found on estuaries as well as on inland waters.

The Red-breasted Merganser (*Mergus serrator*) is much more maritime in winter than the Goosander, being chiefly found on sea-coasts, but it breeds on freshwater lakes as well as inlets of the sea. Its breeding range extends from Ireland and Scotland through northern Europe, Siberia and North America, and it winters south to the Mediterranean, the coast of China, California and Florida. The drake has a crested green head,

SCREAMERS—BIRDS OF PREY

white neck, chestnut upper breast with black streaks, and large white patches in the wings. The duck much resembles the female Goosander but is smaller.

The Smew (*Mergellus albellus*) breeds in northern Europe and Siberia and winters on the coasts and lakes of Europe, including the British Isles, and Asia, south to the Mediterranean, Persia, northern India, southern China and Japan. The drake is largely white, with black patches on the head, back, wings and tail and with a long, white crest. The duck is considerably smaller, with a reddish-brown head without a crest.

Anhimidae (Screamers). This family contains three species of large terrestrial birds found in Central and South America. They have small heads and long necks; their bills are short, covered with soft skin and terminating in a blunt hook; their wings are broad and rounded, with eleven primaries, and each has two sharp spurs near the angle, of which the foremost is the bigger; the legs are stout and rather long, and the long toes, all at the same level, have strong claws, the front ones being connected at the base by small webs. The plumage, which is similar in the two sexes, is mainly black or grey, lighter on the head. One species has a long, slender horn on the forehead, whilst the other two are crested.

Screamers are remarkable for the great development of air-sacs beneath the skin. They inhabit swampy localities, wading in shallow water and swimming with buoyancy. At times they rise high into the air and circle round uttering their very loud calls. These are also made when the birds are on the ground and can be heard for a distance of two miles. The food consists of vegetable matter. The nest is a great pile of reeds and rushes in a wet situation, and contains four to six buffish-white eggs. The young are covered with yellowish-brown down and the spurs on the wings develop very early. They are frequently reared by the natives in poultry yards, where they act as defenders of the fowls, attacking invaders by the use of their sharp spurs.



By courtesy of] [Carl Hagendorf's Tierpark, Stellingen.
HORNED SCREAMER (*Anhima cornuta*).
An inhabitant of tropical South America, allied to the geese and ducks in structure, though so different in appearance.

Order FALCONIFORMES (Birds of Prey)

Members of this very large Order occur in all lands, except the Antarctic, but though some species frequent sea-coasts, none is marine. The group is characterized by the strong, hooked bill with sharp cutting-edges and

AVES (ORDER FALCONIFORMES)

with a "cere" or patch of fleshy skin at the base of the upper mandible. All the species are carnivorous, and have great powers of flight; and the female is larger and more powerful than the male. The feet in all cases have four toes, which usually have sharp curved claws. The eggs are either pure white or white with red blotches, and the clutch is usually small, rarely more than five. The young remain in the nest for a long period and are cared for by the parents.

This Order includes two Suborders, namely, *Falcones* and *Cathartae*.

Suborder FALCONES Family Sagittariidae

Secretary-bird (*Sagittarius serpentarius*). This curious bird is the only species of the only genus in the family. It comes from southern and tropical Africa, and stands about four feet high. Its short, strong beak is greatly arched, its neck is long, its wings are large and broad with eleven primaries, its tail has twelve feathers of which the central pair are long and drooping, its long legs are feathered down to the "knee-joint,"



[Sport & General.
SECRETARY-BIRD (*Sagittarius serpentarius*).
Protected in most parts of Africa as a destroyer of snakes.

and its feet have four short toes with blunt claws. The plumage is mainly bluish-grey, with the primaries, lower back and a band at the end of the tail, black. On the back of the head there is a loose crest of ten black and grey feathers in pairs and from these it derives its name, as they are supposed to resemble quill-pens behind the ears of a clerk or secretary. The cere, the naked sides of the face and the legs are yellow.

The Secretary-bird stalks about on the plains feeding on small mammals, birds, lizards, tortoises, insects and snakes. It has a special partiality for



[Arthur Brook

MERLIN (*Falco columbarius*).
The smallest British falcon, nesting on the ground among heather.

AVES (ORDER FALCONIFORMES)



PEREGRINE FALCON (*Falco peregrinus*).
Generally reputed the swiftest and most fearless of birds.

(Stanley Crook.)

the latter, readily attacking even the most venomous species, kicking forwards with its long legs and shielding its body with outspread wings. It builds a huge nest of sticks and mud in a tree or bush and lays two to three eggs, white with rusty markings. The young are covered with white down and remain in the nest for many weeks.

Family Falconidae (*Falcons, Kestrels and Carrion-hawks*)

The Falconidae include the long-winged hawks of the falconer and the forms allied to them in structure. They are found in all parts of the world, and range in size from the Gyrfalcon of the Arctic regions, two feet in length, to the Finch-hawk of the Malay Peninsula, no larger than a sparrow. The Falcons capture their prey by "stooping" upon it at great speed from the air and striking with their talons; Kestrels hover in one spot with



[Walter E. Hughson.]

KESTREL (*Falco tinnunculus*)

Often called the "Wind hover" from its habit of hanging in the air with rapidly beating wings while it scans the ground for mice.

AVES (ORDER FALCONIFORMES)



By courtesy of Carl Hagenbeck's Tierpark, Stellingen.
HARPY EAGLE (*Harpia harpyja*).
An inhabitant of the jungles of tropical America, feeding
on monkeys and other mammals.

swiftly-beating wings whilst they scan the ground below, whereas the Carrion-hawks walk about on the ground in search of frogs and reptiles, as well as joining Vultures in feeding on carrion.

Peregrine (*Falco peregrinus*). This bird occurs in almost all parts of the world except New Zealand and some of the Pacific Islands. In both sexes the crown, nape and cheeks are blackish, the upper parts slate-grey and the underparts buffy-white or rufous barred with black. The female is called the Falcon by falconers and the male, the Tiercel. For its size the Peregrine is the most powerful and courageous of all the birds-of-prey, feeding on ducks, waders, pigeons, grouse, partridges, rooks and other birds, as well as rabbits. It builds no nest, but lays its two to four eggs in a hollow on the ledge of a cliff or in the old nest of a raven, crow, heron, etc.

Hobby (*Falco subbuteo*). This breeds in England and throughout the greater part of Europe, Asia and north Africa, wintering in tropical and

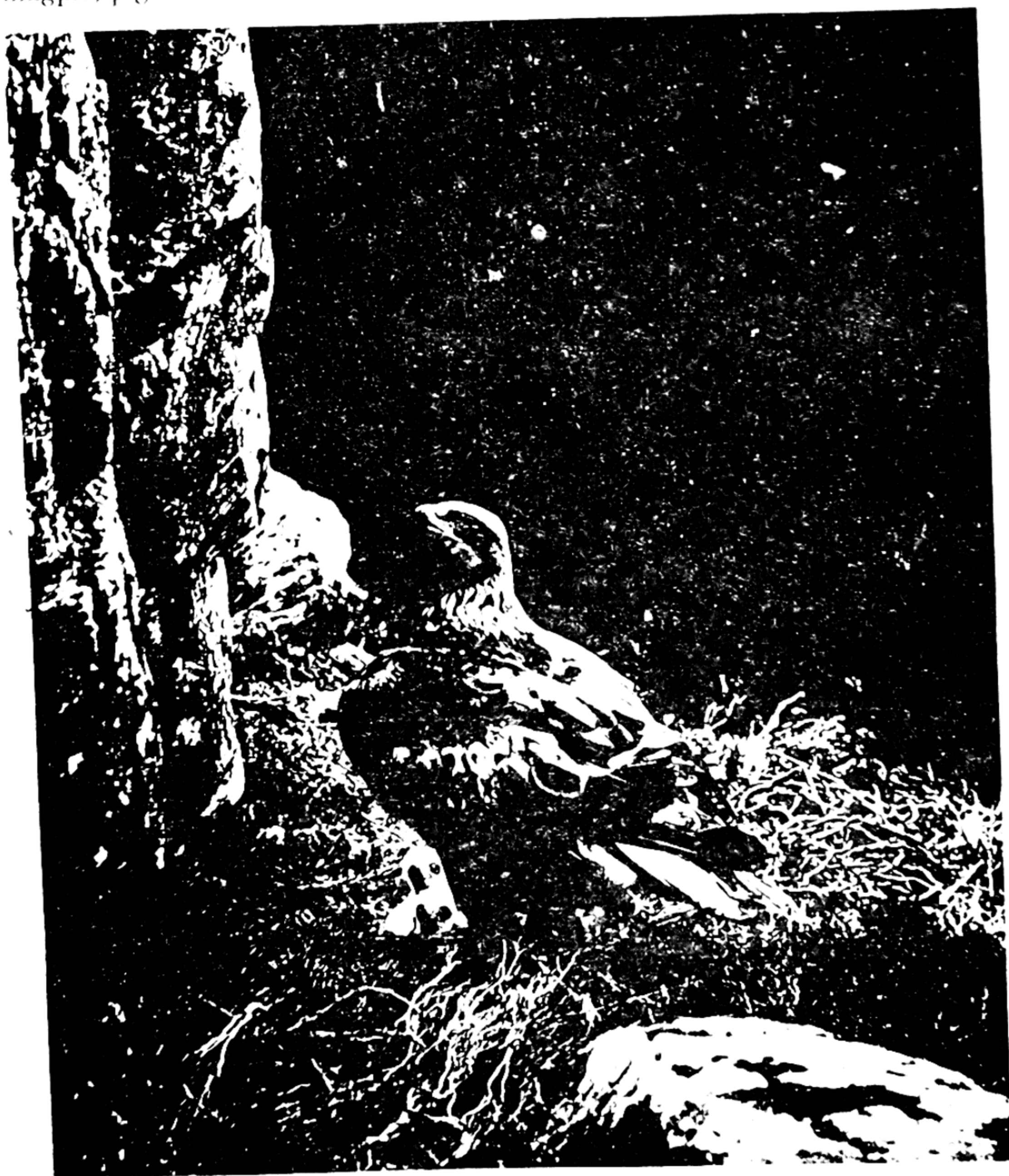
southern Africa and tropical Asia. In colouring it is much like a diminutive peregrine, but its wings are proportionately longer and it feeds mainly on large insects captured in the air. It also preys on small birds, including swallows, and even swifts, caught on the wing.

Merlin (*Falco columbarius*). This breeds in northern Europe, Asia and North America, the majority migrating south to winter in southern Europe, North Africa, India, and Central and northern South America. It is the smallest member of the family found in Europe and feeds largely on larks, pipits, small waders, etc. Its upper parts are slaty-blue, the tail has broad bars of black and a white tip. The underparts are buff streaked with blackish. Its four to six eggs are laid in a hollow on the ground, on the ledge of a cliff or in the old nest of some other bird.

Kestrel (*Falco tinnunculus*). This is one of the commonest birds-of-prey in Europe, northern and tropical Africa and the greater part of Asia. The male has the head, neck, lower back and tail bluish-grey, the latter with a

FALCONS

broad subterminal band of black and a white tip; the back is chestnut with small black spots and the underparts buff, streaked and spotted with black. The female is reddish-brown above barred with black. It feeds almost entirely on mice, lizards and large insects, occasionally taking bats or small birds. Its four to six eggs are laid either in the old nest of a crow, magpie, pigeon, etc., or in a cavity of a cliff, building or hollow tree.



[Arthur Brook]

GOLDEN EAGLE (*Aquila chrysaetos*)

The largest surviving British bird of prey, still to be seen in most parts of the Highlands of Scotland.

AVES (ORDER FALCONIFORMES)



[D. Seth Smith.
GREENLAND FALCON

(*Falco rusticolus candicans*).

This bird is now regarded as a pale race of the Gyr-falcon.

awares. Most of the species will feed upon dead animals as well as upon game they capture alive; Vultures feed almost exclusively on carrion.

Golden Eagle (*Aquila chrysaetos*). This bird is distributed over Europe, north-west Africa, northern and central Asia and North America, chiefly inhabiting mountainous regions, but also found in forests. The adult bird is very dark brown with the back of the head and nape golden-tawny and the tail mottled with grey; immature birds have the bases of the feathers white and show a

Family Accipitridae (Eagles, Buzzards, Kites, Harriers, Vultures and Osprey)

This family contains a very large number of species and is represented in all parts of the world. It includes the species known to falconers as broad-winged hawks, the wings being less pointed than in Falcons and much wider. The flight is not so rapid, the birds of this family commonly sailing round in the air scanning the ground for prey or gliding amongst trees and bushes and coming upon it un-



[Reginald Gaze.

GOSHAWK (*Accipiter gentilis*).

A male bird trained for falconry with the jesses attached to its legs



(Arthur Brook)

BUZZARD (*Buteo buteo*)

The shrill mewling call of this bird is a familiar sound in most hilly or afforested parts of Europe, including northern and western Britain.

AVES (ORDER FALCONIFORMES)



[James's Press.]

LAMMERGEIER (*Gypaetus barbatus*).

The largest bird of prey of the eastern hemisphere, inhabiting mountain ranges in many parts of the old world.

white band across the base of the tail. The legs are feathered down to the feet. It feeds on hares, rabbits, marmots, fawns, lambs, grouse, waterfowl and other large birds. and some of these items have led to its being exterminated in regions where sheep-farmers or game-preservers

have waged war upon it. In the British Isles it is now confined to the Highlands of Scotland, but was formerly found also in southern Scotland, northern England, Wales and Ireland. The nest is a large structure of sticks built in a tree or on the ledge of a cliff, and two to three eggs are laid.

Buzzard (*Buteo buteo*). The Buzzard is found throughout Europe and northern Asia, chiefly in forests or in hilly and mountainous country. In the British Isles it now breeds only in Scotland, Wales and western England, but occurs elsewhere at other seasons. Its plumage is entirely brown, but there is great individual variation in its shade and in the amount of mottling with lighter tints. It feeds on small mammals, reptiles, frogs and large insects, occasionally taking small birds. It builds a nest of sticks either in a tree or on the ledge of a cliff and lays three or four eggs.

Hen Harrier (*Circus cyaneus*). This Harrier occurs throughout most of Europe, northern Africa, Asia and North America, breeding in the northern parts of its range and wintering further south. The male has the upper parts and the breast bluish-grey, the rump and the underparts white; the much larger female is dark brown above with the rump white and the tail with dark bars, beneath buffish-brown with darker stripes. Like other Harriers, this species frequents open country, moors, downs, fields and marshes, systematically quartering the ground in search of small mammals, birds and their eggs and young, reptiles and frogs. The nest is placed on the ground among heather or reeds or in corn-fields and is often a bulky mass of roots and plant-stems. The four to six eggs are bluish-white, usually without markings.

Montagu's Harrier (*Circus pygargus*) is a smaller, more slender bird than the Hen Harrier, with proportionately longer wings, which breeds in England

HARRIERS AND KITES

and in the warmer parts of Europe and Central Asia, wintering throughout Africa and in tropical Asia.

The Marsh Harrier (*Circus aeruginosus*), as its name implies, frequents swamps and lakes, placing its nest among the reeds, and feeding largely on young waterfowl as well as on frogs and reptiles. In such localities it is found throughout Europe, North Africa and western Asia in summer



OSPREY (*Pandion haliaetus*)

Capt. W. F. Knight

The male bird is here seen carrying a large fish to the nest

wintering in the tropics. In the British Isles it was formerly widespread but is now restricted to the Norfolk Broads. Its plumage varies much according to sex and age, but is predominantly dark brown, with a yellowish head, and it is a stouter bird than the Hen and Montagu's Harriers, with broader wings.

Kite (*Milvus milvus*). This bird occurs throughout Europe, also in north-western Africa, the Canary Isles and the Cape Verde Islands. In the British Isles it was formerly abundant but at the present time is only

AVES (ORDER FALCONIFORMES)



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen.

KING CONDOR (*Sarcorhamphus papa*). The plumage of this South American vulture is creamy white and black, the bare skin of its head and neck red, orange, yellow and blue.

former times they were valuable scavengers. The nest of sticks is usually placed in a tree and the eggs are commonly three.

Sparrowhawk (*Accipiter nisus*). The Common Sparrowhawk is found throughout Europe, and in northern Africa and most of Asia. It is common in the British Isles. The very small male has the upper parts slaty-blue and the underparts buff, barred with reddish-brown; the much larger female is greyish-brown above and greyish-white barred with brown below. The food consists principally of other birds, which

very occasionally met with except in Wales, where a few pairs still breed. The sexes are almost alike, but the male is slightly smaller and more brightly coloured than the female. The head and neck are white, striped with black, the back and tail rufous, the primaries blackish and the underparts rusty, striped with dark brown on the breast. The tail is very deeply forked. Kites feed on small mammals, young birds, reptiles, frogs and insects as well as on carrion; in fact, anything that they can find or surprise on the ground. In



CHILEAN EAGLE (*Geranoaetus melanoleucus*). This striking bird with grey plumage and black breast is wide spread in South America.

GRIFFON VULTURE AND OSPREY

are snapped up as it glides with rapid but stealthy flight along hedges or the skirts of woods. The nest of sticks is built in a tree, but frequently the old nest of a Crow or other bird is adapted and added to ; four to six eggs are laid.

Griffon Vulture (*Gyps fulvus*). This bird is found in most parts of Africa and Asia and in eastern and southern Europe. It is one of the largest members of the family, being about four feet long and having a wing-span of nine feet, whilst it weighs from eighteen to twenty pounds. Its plumage is brown, becoming almost black on the wings and tail ; the head and neck are devoid of feathers, but are covered with short white down, and there is a ruff of long white filaments round the lower neck. Its food, like that of other vultures, is the carcasses of dead animals. These it discovers while circling at a great height, and as soon as one bird sights a carcass and descends to feed,



[H. E. Pounds.

SPARROWHAWK (*Accipiter nisus*).

Still common in wooded parts of the British Isles despite the enmity of the gamekeeper.

other Vultures note its behaviour and come to investigate, so that a large number frequently assemble in a very brief period. The nests of branches and grass are built on overhung ledges of cliffs and many pairs often breed in close proximity. The single egg (occasionally two) is usually white, but is sometimes blotched with rusty brown.

Osprey (*Pandion haliaëtus*). This is one of the most widely-distributed birds, being found almost throughout the world, except in southern South America, New Zealand and some of the Pacific Islands. It no longer

AVES (SUBORDER CATHARTAE)

breeds in the British Isles, though until recently it did so in Scotland, but individuals appear every year on migration. Its food consists of fish, upon which the bird plunges, often from a considerable height, and which are seized and carried away in its feet. It is frequently called the "Fish-hawk." Its claws are sharp and much curved, the soles of its feet are very rough, and the outer toe can be turned backwards. The plumage of

the upper parts is brown, of the head and underparts white somewhat streaked and spotted with brown, and there is a dark line from the eye across the cheek. The nest is a very large pile of sticks with a small cavity on the top, and is placed in a tree or on a cliff or rock, either on the sea-coast or near a lake. Two or three eggs are laid.



VOCIFEROUS SEA EAGLE

(*Haliaeetus vocifer*).

The African representative of the American Bald Eagle and the European White-tailed Eagle.

Suborder CATHARTAE

Family Cathartidae (*American Vultures*)

This family contains six species of large birds-of-prey found in North and South America. They have hooked but rather slender and weak bills; the head and neck are more or less bare; their wings are very large and their feet have slender toes and blunt claws. In their habits they differ little from the Griffon and other Vultures of the eastern hemisphere, spending the day circling high above the ground on the look-out for carrion and at night roosting in companies. They are generally silent birds, uttering low grunts or hissing sounds when alarmed or excited. They build no nest but lay from one to three eggs under logs on the ground or in caves.

The young when hatched are naked, but soon become covered with thick white or buff down.

Turkey Buzzard (*Cathartes aura*). This bird is found from southern Canada to northern Patagonia, but is most abundant in the tropics and withdraws from the colder regions in winter. Its plumage is glossy black and the naked skin of its head and neck is bright red.

Condor (*Vultur gryphus*). The Condor occurs along the western side of South America from Ecuador to the Straits of Magellan, and also in Patagonia. Though perhaps most commonly found high up in the Andes, it is not

AMERICAN VULTURES



RÜPPELL'S VULTURE (*Gyps ruppellii*).
One of the commoner vultures of the Sudan and adjacent parts of Africa.

they visit the guano islands off the Peruvian coast to devour the eggs of cormorants, gannets and pelicans, but their food is mainly carrion. They breed on ledges of cliffs, laying two white eggs, and the young are said to remain in the nest for nearly a year before they can fly.

Family Teratornithidae

This family contains the extinct bird *Teratornis merriami*, an almost complete skeleton of which has been obtained in the asphalt beds of Rancho La Brea, near Los Angeles, California. These are of Pleistocene age and

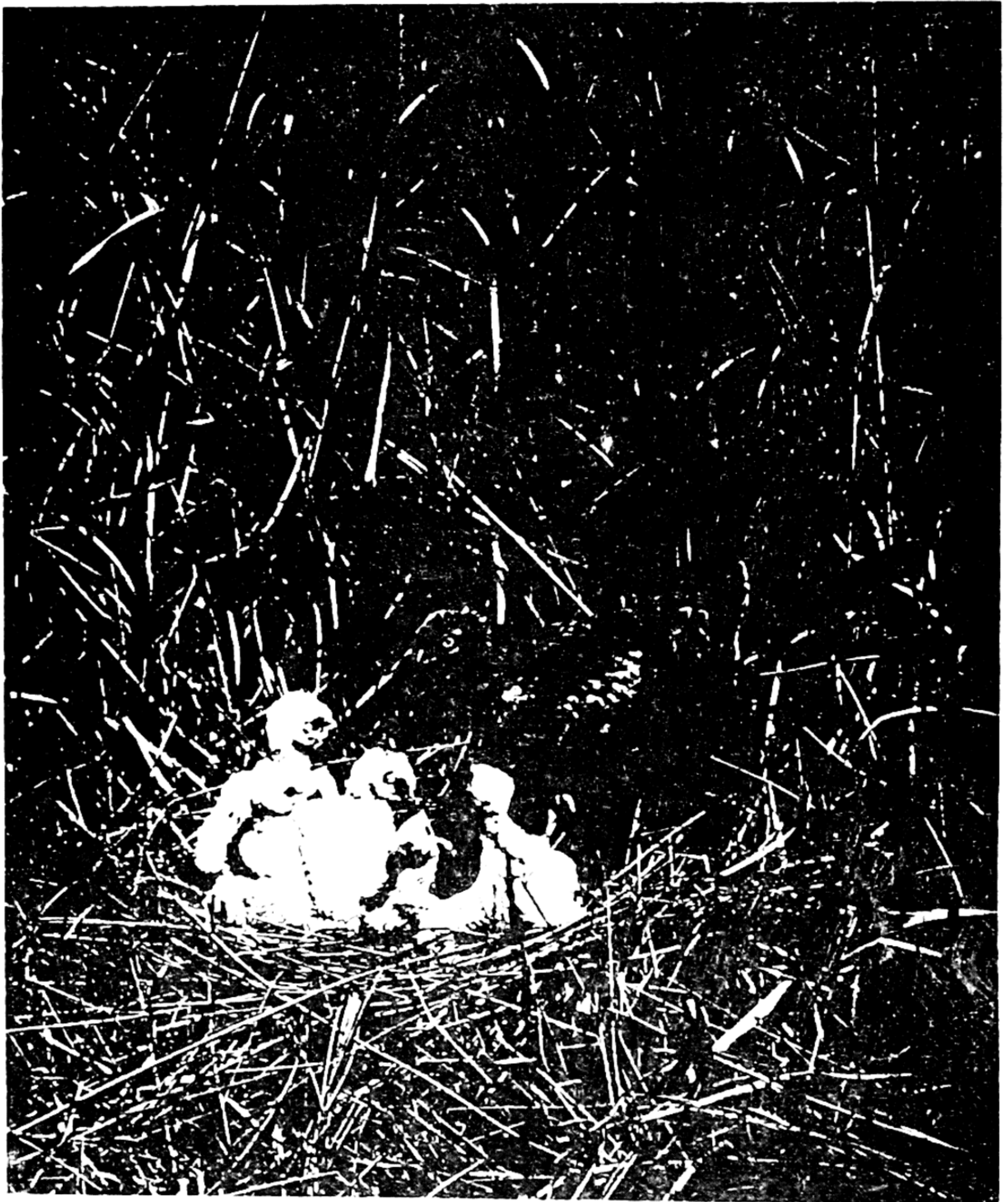
infrequent down to the coast. It is the largest existing bird capable of flight, its wing-expanse frequently exceeding twelve feet, whilst the largest specimen on record measured fifteen feet. Its plumage is mainly brownish-black, with a large white patch on each wing and an oblique ruff of white down on the lower neck. The head and neck are bare, the skin on the latter being curiously wrinkled, whilst the male has a fleshy crest or comb on the forehead and a large wattle on the throat. These parts are dull red. Condors are said at times to attack young or sick animals and



Photos] (W. S. Birrdge
KOLBE'S VULTURE (*Gyps coprotheres*).
The South African representative of the European Griffon.

AVES (SUBORDER CATHARTAE)

of the bird remains found in them more than half the species are still living, so that Teratornis was contemporary with many existing North



MONTAGU'S HARRIER (*Circus pygargus*).
The hen bird at her nest on the ground. Note the varying sizes of the chicks, showing that incubation began when the first egg had been laid.

American birds. It was allied to the Condors, but exceeded them in size, being the largest flying bird known.

Order GALLIFORMES (Game-birds)

A large group of birds which has representatives in all parts of the world. Its members are either terrestrial or arboreal, and are usually of moderate or large size. They have stout, arched bills of moderate length, and feed largely on grain, berries, shoots of plants and other vegetable matter, varying their diet with insects, snails, etc. They form an important element in the food-supply of mankind, many species in the wild state providing sport (Pheasants, Partridges, Quails, Grouse, etc.) while a number have been domesticated (Fowls, Turkeys, Guinea-fowls).

This Order includes two very different Suborders, *Galli* and *Opisthocomi*.

Suborder GALLI

Family Megapodiidae (*Mound-birds*)

This family contains about twenty species of large or moderate-sized terrestrial game-birds found in Australia and the islands of the Malay Archipelago, the range of the family extending east to Samoa, north to the Philippines and westward to the Nicobar Islands. They have short, stout arched bills; short, broad wings with ten primaries; rather long tails and very stout legs and large feet, with the four toes all at the same level. The sexes are alike in all the species, but the colouring of the plumage varies greatly, and many have the head and neck more or less naked, the bare skin being usually brightly coloured. They are shy birds which frequent forests or bushy localities, often near the sea; they run swiftly, and when alarmed often fly heavily up into the lower boughs of trees. Their food consists of fruits, berries, worms, snails and insects.

In their breeding habits the Mound-birds differ from all other birds, as their eggs are deposited in incubators and not in nests. These incubators consist of mounds of earth or sand, mixed with sticks and leaves, scratched up by the birds with their powerful feet from a large area. The mound is constructed largely or entirely by the male bird, which begins to scratch up material some months before the breeding season. The first season's mound is only small, but as it is added to year after year, it may ultimately attain a very large size.

In the case of the Australian Scrub-fowl mounds ten feet high and seventy feet in circumference are often met with, and a specially large one was estimated to contain two hundred and ninety-seven cubic yards of material weighing approximately three hundred tons. Each female probably lays from nine to fifteen eggs in a season, at intervals of about three days. Sometimes three or four females lay in the same mound, so that it may contain over forty eggs. The female deposits her egg in a hollow which she scratches out in the mound. The eggs are very large in proportion to the size of the bird and have very thin shells, in colour they may be white, pinkish or yellowish when fresh, but soon become stained brown. As soon as an egg has been laid, the male bird places it

AVES (ORDER GALLIFORMES)



By courtesy of] [Carl Hagenbeck's Tierpark, Stellingen.
HELMETED CURASSOW (*Pauxi pauxi*).
An inhabitant of northern South America, also called the "Cashew-bird."

in an upright position with the smaller end downwards. The eggs are often arranged in irregular circles. Those first laid forming the lowest ring, those in the higher rings never being vertically above those at lower levels. While incubation is in progress, the birds are never far from the mound, and constantly work at it, opening it up to admit sunshine or moisture as required, or banking it up in unfavourable weather. By these means a temperature of about 95°F. is maintained in the interior

of the mound. The eggs hatch after about two months and the chick gradually scratches its way to the surface; though its body is covered with down, the quill-feathers of the wings are already large and it can fly almost immediately. Its legs also are strong, and it at once starts to scratch for food and lead an independent existence, the care of the parents being entirely devoted to the incubator.

Brush Turkey or Scrub Turkey (*Alectura lathamii*). This bird inhabits forests and scrubs in Queensland and New South Wales. It is about two feet long, and its plumage is dull black; the naked skin of its head and neck are red and large wattles on the lower neck are either yellow or purplish-white. The mound of this species is comparatively low, usually only from two to four feet high, with a circumference of about thirty-five feet. It is composed mainly of leaf-mould and is usually in the shade of trees, so that the necessary temperature is derived more from the decay of moist vegetable material than from the sun.

Mallee Fowl (*Leipoa ocellata*). The Mallee Fowl inhabits the inland districts of southern and western Australia. It is about two feet long and its plumage is mottled with rufous, brown and white, the markings on the back and wings resembling eyes; it has a small fuscous crest. Its mound is usually formed in an open situation among low trees or bushes and consists largely of sand, with a bed of leaves and other debris in the centre, in which the eggs are placed. The overlying sand is scratched off by the birds in sunny weather and replaced at night or in dull weather, the heat being mainly derived from the sun.

MOUND-BIRDS AND CURASSOWS

Family Cracidae (*Curassows*)

This family contains about forty species of large or moderate-sized arboreal game-birds found in tropical America from southern Texas to northern Argentina. They are usually handsome birds with broad wings, rather long tails and very large feet, in which the long hind-toe is at the same level as the three front ones. Many of the species have brightly-coloured, fleshy wattles on the cheeks or throat and some have excrescences on the forehead. They frequent forests, feeding on leaves and fruit, and some species rarely descend to the ground. They build large, loosely-constructed nests of twigs, grass, moss and leaves on a horizontal branch, bush or stump, and lay from two to five white eggs with a hard granulated shell. The young climb and hop about the trees soon after they are hatched.

Family Gallinuloididae contains one of the few species of fossil birds of which a nearly complete skeleton is known. *Gallinuloides wyomingensis* from the middle Eocene beds of Wyoming shows much resemblance in structure to the Curassows.



CAPERCAILLIE (*Tetrao urogallus*).

[Arthur Brook.]

A female on her nest in Scotland, where the species is now thoroughly re-established by introductions from the Continent after having been exterminated in the eighteenth century.

AVES (ORDER GALLIFORMES)

Family Tetraonidae (*Grouse*)

This family contains about twenty species of large or moderate-sized game-birds, terrestrial or partially arboreal in habits. They occur in the northern portions of the northern hemisphere. From members of the other families of the Order, Grouse are distinguished by having the nostrils covered by feathers and the legs partly or completely feathered. They never have spurs on the legs. In some species the feathering of the legs extends to the toes, in the remainder the toes have comb-like rows of scales on the sides which are moulted annually. Sometimes the sexes are alike, more usually the males are larger than the females and more brightly coloured. These species are polygamous and the males strut about, dance or fight in the mating season, frequently making booming or drumming sounds. Several of the American species have air-sacs at the sides of the neck, which can be inflated and give resonance to the booming calls. The nest is a hollow on the ground, usually sheltered by shrubs or low vegetation, and numerous eggs are laid. The young are hatched thickly covered with down, usually of a pronounced pattern, and leave the nest soon after birth. In the autumn, Grouse unite in small flocks. Their flight is rapid and accompanied by a startling whirr, caused by the quick strokes of their concave, stiff-feathered wings. When they have attained speed, periods of flapping are alternated with gliding, when the curved wings are held rigid.

Capercaillie (*Tetrao urogallus*). This bird inhabits the coniferous forests of northern Europe and western Siberia and of the Pyrenees, Alps, Carpathians, Balkans and Urals. It became extinct in the British Isles about 1770, but was reintroduced in Perthshire in 1838 and is now fairly common in central Scotland. It is the largest member of the family, the cock, which is considerably larger than the hen, approaching the turkey in size. His plumage is greyish or brownish black, darker below and deep glossy green on the breast. The hen is chiefly brown, mottled with buff and white. Capercaillies spend much of their time in the trees, feeding on the tender shoots of pines and larches, as well as on berries in the autumn. The six to twelve eggs are pale reddish-yellow with brown spots and blotches.

Black Grouse (*Lyrurus tetrix*). This grouse occurs in mountainous and hilly districts throughout most of Europe and Siberia, including the western and northern parts of Britain, though it is not found in Ireland. The male, known as the Black-cock, is bluish-black with white patches in the wings and beneath the tail. The tail-feathers curve outwards at the end on each side. The female, or Grey-hen, is brownish above, barred with chestnut and greyish on the breast, with some white in the wings. This species frequents woodlands as well as open country, usually in the vicinity of water, feeding on berries, seeds, buds and shoots of various plants. The six to ten eggs are yellowish-white spotted with orange-brown.

GROUSE (TETRAONIDAE)

Red Grouse (*Lagopus scoticus*). This is the only species peculiar to the British Isles, where it occurs on the moorlands of Scotland, northern England, Wales and Ireland. Its food consists mainly of the shoots of heather and other moorland plants, but the young chicks also eat numerous insects. The colour of the plumage varies considerably in different individuals, the cock being mainly brownish-red barred and mottled with black, whilst the hen is paler reddish-brown or yellowish-brown marked with brownish-black. The eight to ten, or even fifteen, eggs are buffish-white mottled with red or brown.

Ptarmigan (*Lagopus mutus*). This inhabits the Arctic regions of Europe, Asia and America and the summits of the principal mountain ranges of



[Charles Reid

PARTRIDGES (*Perdix perdix*).
The familiar game-bird of the cultivated districts of the British Isles.

Europe and northern Asia above the level of trees. In summer the plumage is mainly brownish-grey, but the wings are white. In winter the plumage is entirely white. The eggs resemble those of the Red Grouse, but are smaller and paler.

Family *Perdidae* (*Partridges and Quails*)

This family contains many species of terrestrial game-birds of small or moderate size and is represented in all parts of the world but southern South America and the Pacific Islands. Members of this family are usually plainly-coloured, shades of brown and grey predominating in the plumage, sometimes diversified with black, white or rufous. The sexes are usually similar and the males are monogamous. Spurs on the legs are only found in a few of the species and special ornaments are rare, though

AVES (ORDER GALLIFORMES)

many of the American species have crests. Most of the species roost on the ground and only exceptionally fly up into trees. The nest is a hollow, and the numerous eggs are white, yellowish or olive, either plain or spotted with rufous or brown. The downy chicks can run soon after hatching.

Common Partridge (*Perdix perdix*). This is widely distributed in Europe and western Asia, frequenting open country in the vicinity of bushes or thickets, and fields surrounded by hedges. It feeds on shoots, leaves and seeds of various plants, in summer also taking insects. The brown upper plumage varies considerably in shade in different individuals, and the chestnut horseshoe-shaped mark on the grey breast is much more distinct in some individuals than in others.

Red-legged or French Partridge (*Alectoris rufa*).



QUAIL (*Coturnix coturnix*).

This little migratory game-bird has become very scarce in Britain.

(M. H. Crawford)

This bird is a native of south-western Europe, and the Canary Islands. It was introduced into England about 1770 and is now well established in most of the eastern and southern counties. It is slightly larger than the Common Partridge, has white cheeks and throat bordered by a black band, chestnut, white and black stripes on the flanks, and red legs.

Quail (*Coturnix coturnix*). This bird ranges throughout Europe, Asia and Africa, and in the northern parts of its range is chiefly only a summer visitor. Very large numbers cross the Mediterranean in autumn and spring, and at the former season immense numbers are captured in nets all along the north coast of Africa when they arrive exhausted after their passage. From Egypt alone over a million were annually exported prior to 1914, and, in addition, great numbers were consumed locally. In spring very many are shot or captured in the southern countries of Europe. It is not surprising that in recent years the species has greatly decreased in numbers and comparatively few now visit the British Isles. The Quail resembles a very small Partridge with light streaks on the upper parts. Its curious three-syllabled call-note resembles the words "Wet-my-lips."

Francolins (*Francolinus*). The plumage of these birds is in the main black, marked with white, buff-yellow and chestnut. There are some thirty-five species, thirty found in Africa and five in Asia.

PARTRIDGES AND PHEASANTS



GREY PEACOCK-PHEASANT
(*Polyplectron bicalcaratum*).
An inhabitant of the jungles of the Malay Peninsula and Sumatra.

Family Phasianidae

(*Fowls, Pheasants, Peacocks, etc.*)

The Pheasant family contains numerous species of large or moderate-sized terrestrial or semi-arboreal game-birds. Their headquarters are the jungles and mountain-forests of south-eastern Asia, but some members of the family occur in almost all parts of Asia and reach south-eastern Europe. In the majority the sexes are different, the hens being often comparatively dull-coloured whilst the cocks have most brilliant plumage, some of them being amongst the most magnificently-coloured birds. In very many

species the tail is very long, the feathers being arched; fleshy combs and wattles are often present on the head; the legs are long and are frequently furnished with one or more spurs, and the feet are large and strong, having four toes, of which the posterior one is at a higher level than the three in front. The males are commonly polygamous and crow in rivalry; the females make various clucking calls. The nest is always a mere hollow on the ground and numerous eggs are generally laid. The chicks are covered with down and run shortly after hatching.

Red Jungle-fowl (*Gallus gallus*). The ancestor of the domestic breeds, is a native of India, the Indo-Chinese countries and the Malay Peninsula and Archipelago east to the Philippine Islands and Timor. It closely resembles the Black-breasted Game breed of poultry fanciers and inhabits forests, jungles, and bamboo-thickets, coming out into clearings to feed. The cock crows like a Bantam. The hen lays from eight to ten creamy-white eggs.

The Jungle-fowl was probably first domesticated in Burma and was introduced into China about 1400 B.C. It is not mentioned in the Old Testament or in Homer, nor is it figured on ancient

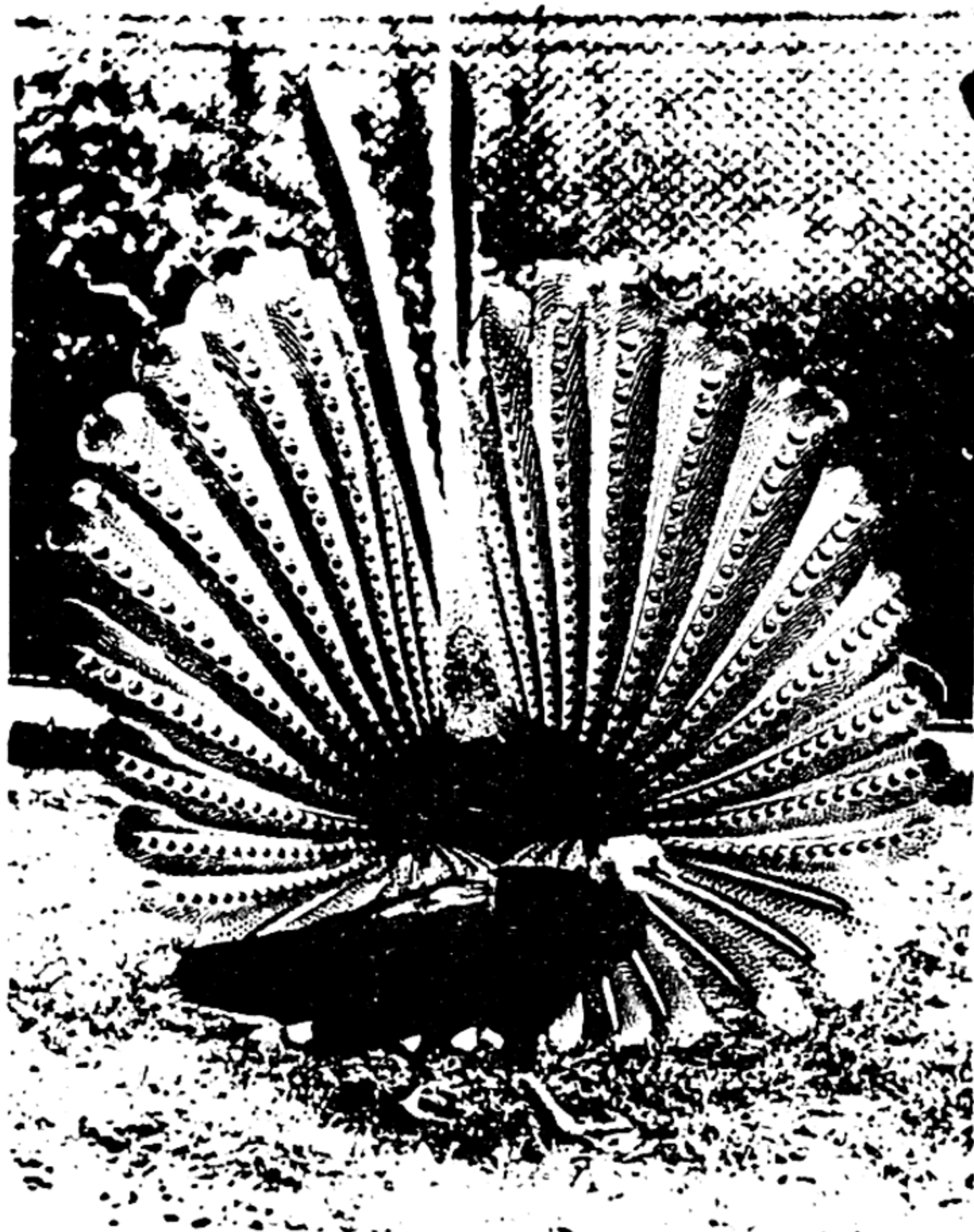


[Photos] JAVAN OR GREEN JUNGLE-FOWL (*Gallus varius*)
A native of Java, Lombok and Flores, where it represents the Red Jungle-fowl from which the domestic fowl has developed.

AVES (ORDER GALLIFORMES)

Egyptian monuments, but it appears on Babylonian cylinders of the 7th to 6th centuries B.C. and on Lycian marbles of about 600 B.C. It is mentioned by Pindar and Aristophanes, the latter calling it the Persian bird, indicating that it was probably brought to Greece from Persia.

During the very long period in which poultry have been domesticated a large number of distinct breeds have been produced, differing in size, colour, the form of the comb and the shape of the tail, as well as in the feathering of the legs. The least modified are the various Game breeds, developed when cock-fighting was a universal sport, in which the very strong legs have strong, sharp spurs. In some of the breeds which are reared specially for the table the birds are very much heavier than the wild original stock. In other breeds the hens have been specially selected for their egg-laying capabilities and individuals often lay more than three hundred eggs in a year. Finally, Bantams and other "fancy" breeds are kept with no special utilitarian object.

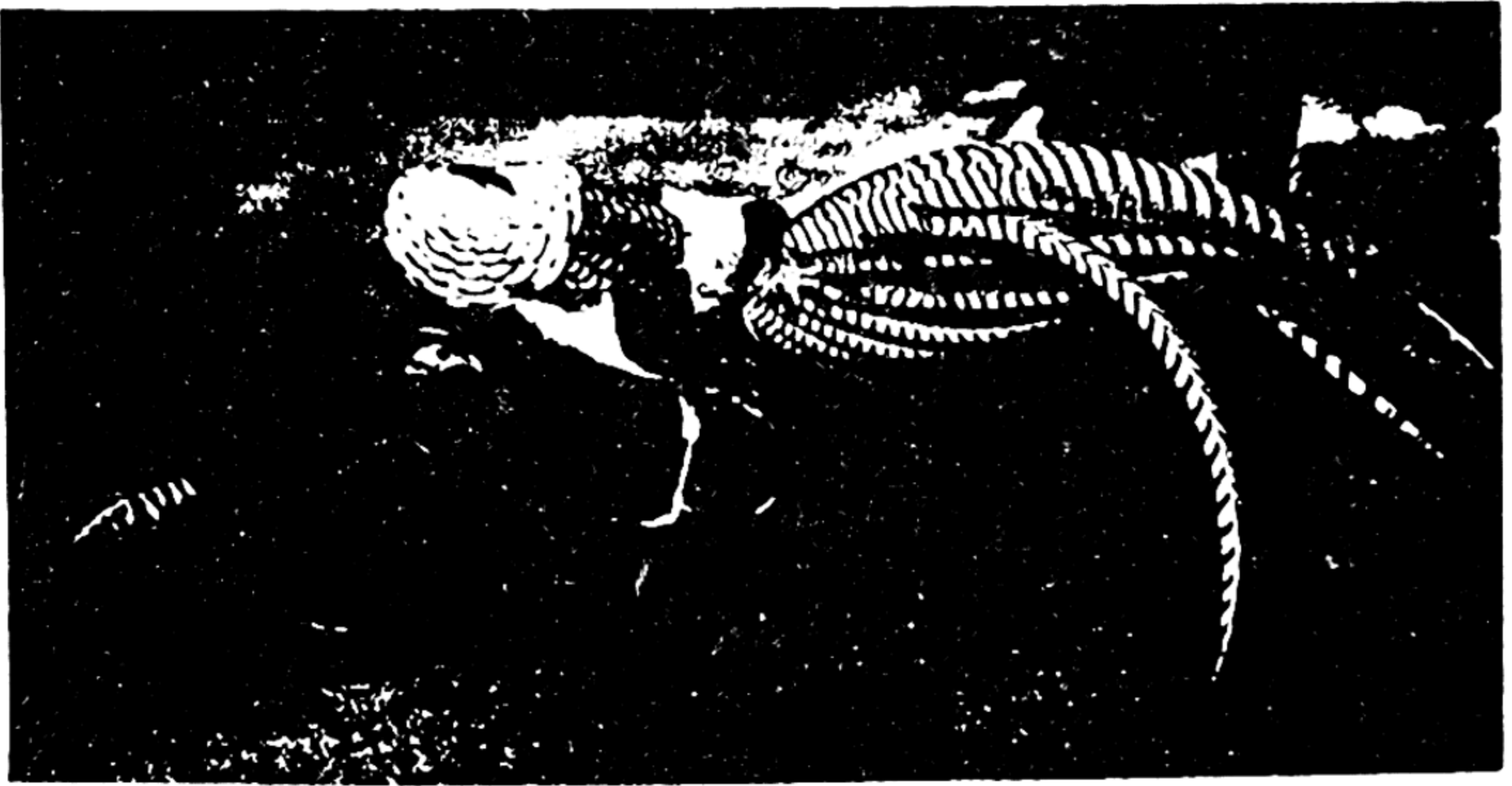


(D. Seth-Smith.

ARGUS PHEASANT (*Argusianus argus*).
This picture gives an excellent idea of the remarkable display of the cock bird.

Common Pheasant
(*Phasianus colchicus*).
This ranges in its original wild state from south-eastern Europe across Central Asia to China and Japan, the birds from different regions in this large area presenting minor differences in colour. The most westerly form, which has no white on the neck, is believed to have been introduced into western Europe, including the British Isles, by the Romans. During the 19th century the Chinese form, with a white ring round the neck, was introduced into England and crossed freely with the established race, whilst smaller numbers of various other races have also been introduced. The birds now

PHEASANTS



[Photopress.]

LADY AMHERST'S PHEASANTS (*Chrysolophus amherstiae*).
The cock bird is displaying his wonderful cape of white feathers with blue-black bars, to the hen.

found in the British Isles and also in western Europe and North America are thus the mixed descendants of various Asiatic races. The appearance and habits of the Pheasant are too well-known to need description.

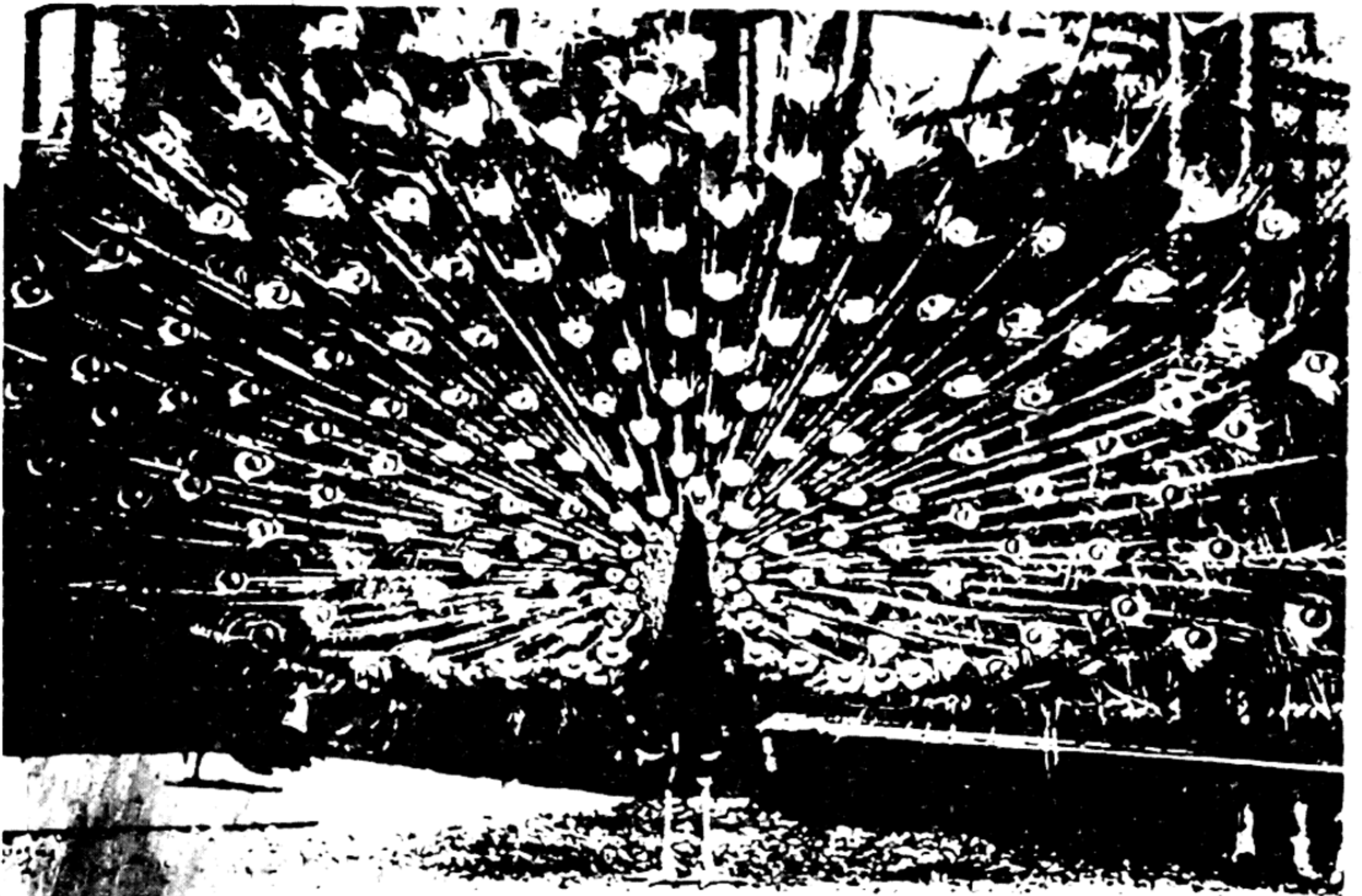
Golden Pheasant (*Chrysolophus pictus*). This bird is a native of southern China and Tibet, and is frequently kept in aviaries. It is much smaller than the Common Pheasant. The cock has a crest of golden, hair-like feathers and on the back of the neck an erectile cape of truncated orange feathers with blue-black bars; the back is green and purple, the rump golden and the underparts scarlet; the arched tail is black and its central feathers are very long.

Lady Amherst's Pheasant (*Chrysolophus amherstiae*) of western China and eastern Tibet, is similar in form to the Golden Pheasant, but the cock is very differently coloured. His crest is red, his cape white with blue-black bars, his throat, chest and back dark green, his underparts white and his tail black and white.

Silver Pheasant (*Gennaeus nycthemerus*). This is also a native of south China and is frequently seen in captivity. It is a small species with an exceptionally long tail. The cock has the crest and underparts purplish-black, whilst his back and tail are white marked with black and his naked cheeks are red.

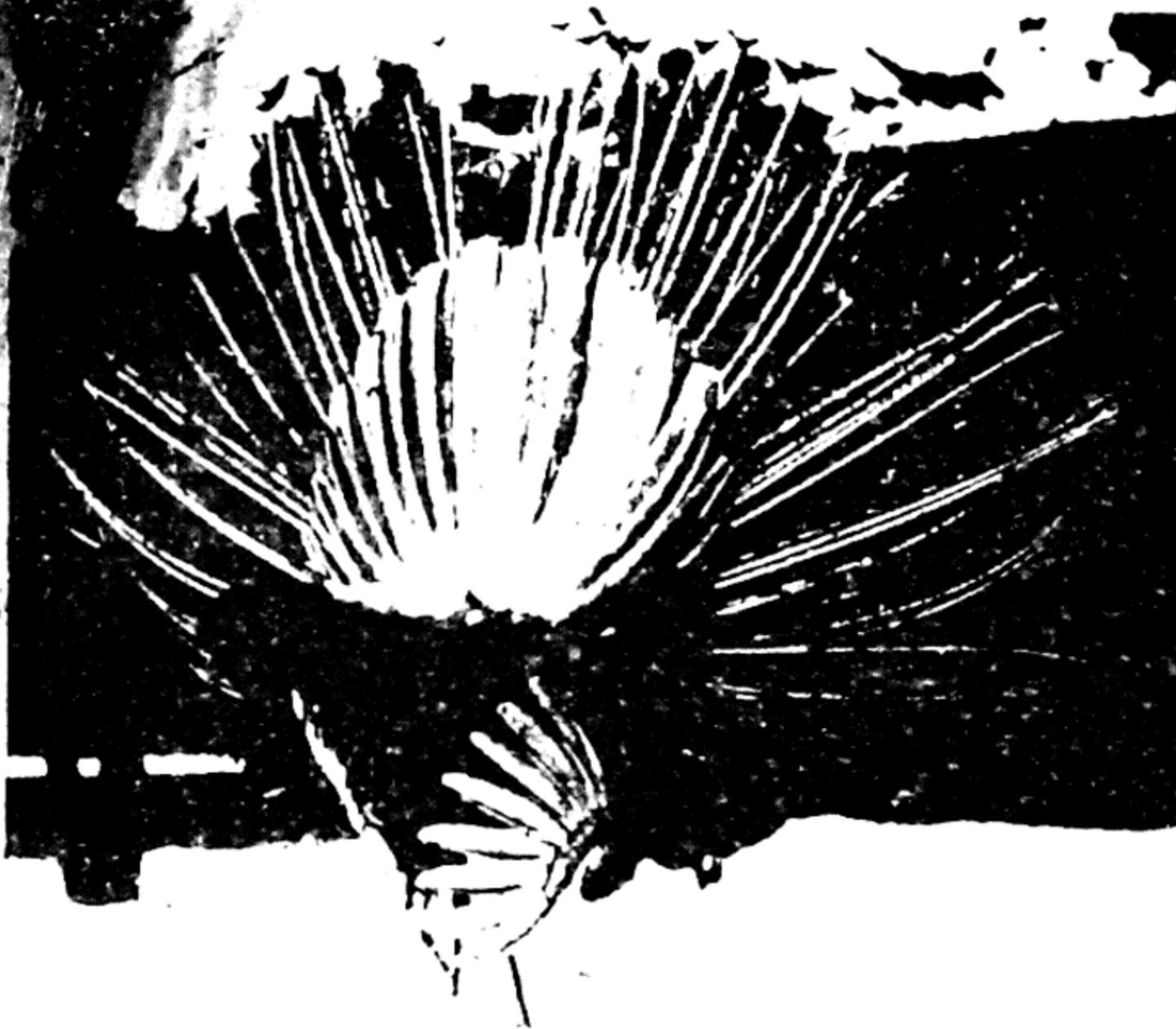
Argus Pheasant (*Argusianus argus*). This inhabits the forests of the Malay Peninsula and Sumatra. The plumage of the cock is a mixture of black, rufous and buff. The secondary feathers of the wing and the middle tail-feathers are extremely large and are decorated with many eye-like spots with reddish-yellow or white centres ringed with black. When the bird displays, these enlarged feathers are spread out to form a great fan.

AVES (ORDER GALLIFORMES)



JAVAN PEACOCK (*Pavo spicifer*).
Displaying its ornamental train to best advantage.

[W. S. Berridge.]



PEACOCK (*Pavo cristatus*).
Seen from behind, showing how the train is supported by the stiff tail feathers during display.

[Neville Kingston.]

Peacock (*Pavo cristatus*). This is a native of India and Ceylon, and has been kept in parks and gardens in Europe since classical times, and its flesh was formerly highly valued at banquets. Its appearance and harsh scream are too familiar to need description, but it is worth mentioning that the wonderful train of the cock bird is formed by the greatly-elongated tail-coverts and when it is spread, is supported by the stiff tail-feathers which are raised behind it.

PEACOCKS AND GUINEA-FOWLS

Family Numididae (*Guinea-fowls*)

The family Numididae contains about seven species of rather large terrestrial birds found in Africa, south of the Sahara, Arabia, Madagascar and the Mascarene islands. They have the head and neck partly or completely devoid of feathers, the naked skin being usually blue, sometimes red or yellow. In some, including the Domestic Guinea-fowl, there is a bony casque on the top of the head, in others a crest of curly feathers. Some species have spurs on the legs. The plumage is usually black, more or less diversified with white and with white or blue spots on the black feathers.

Guinea-fowls are usually found in flocks in rather open country with scattered bushes and trees. They run swiftly on the ground, flying up into trees to roost at night or when disturbed. They feed on grass, seeds, roots, berries and insects. The nest is a depression on the ground, usually in the shelter of a tussock, and contains from twelve to twenty yellowish eggs freckled with rusty.

Domestic Guinea - fowl (*Numida meleagris*). This is a native of West Africa and was probably brought to Europe in the 15th century by the Portuguese. It has altered little in domestication. Some species of Guinea-fowl was known to the Greeks and Romans in classical times, but there is no evidence that it continued in domestication during the Middle Ages. The bird and its call, "come-back, come-back," are too well-known to need description.



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen.

VULTURINE GUINEA-FOWL

(*Acryllium vulturinum*).

The most curious member of this African family.

Family Meleagridae (*Turkeys*)

The Turkey family contains only two species. Both are very large birds, natives of North and Central America. They frequent wooded country, associating in small flocks and roosting in the trees. The males

AVES (ORDER GALLIFORMES)

are polygamous and fight for the possession of the harem. The females alone incubate the eggs and care for the brood. The nest is a mere hollow on the ground at the base of a bush or tree, and contains from ten to fourteen eggs, pale creamy - buff evenly speckled with greyish-brown. The downy chicks can run very soon after they are hatched.

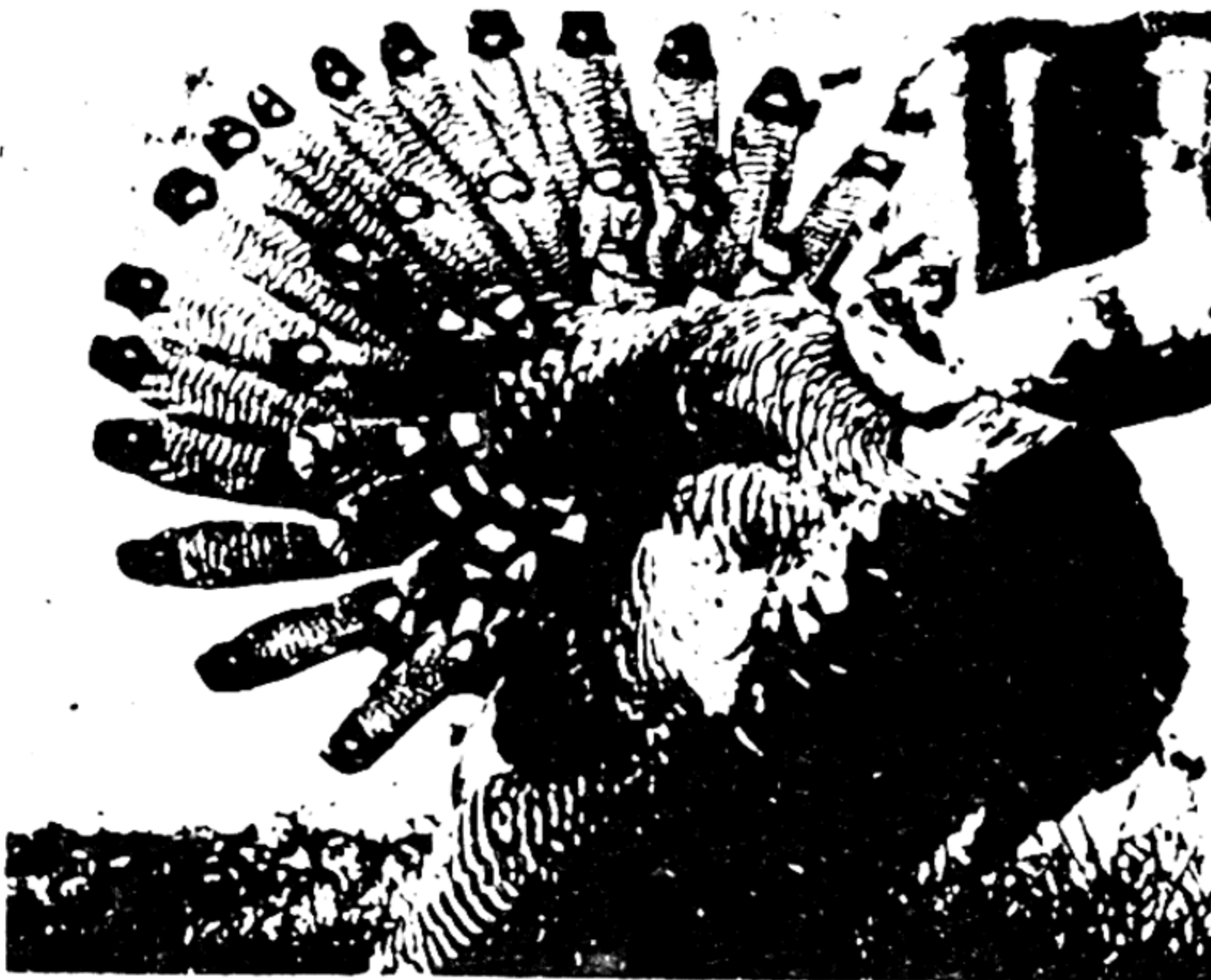
Common Turkey (*Meleagris gallopavo*). This bird in the wild state is found from southern Canada through the eastern and southern United States to Mexico. It was plentiful in the early



[F. W. Bond.]

WILD TURKEY (*Meleagris gallopavo*).

The North American ancestor of the domestic bird, which since its introduction from Mexico in the sixteenth century has become specially associated with Christmas feasts.



[Keystone.]

OCCELLATED TURKEY (*Meleagris ocellata*).

This second member of the Turkey family, native of Central America, has never been domesticated.

period of European settlement in America, but is now only found in the more inaccessible regions. In Mexico it had been domesticated before the Spanish conquest and was introduced into Europe almost immediately, being known in England by 1541. It has varied little in domestication and its appearance and habits are too well-known to need description.

HOATZIN

Suborder OPISTHOCOMI

Family *Opisthocomidae* contains only the Hoatzin (*Opisthocomus hoazin*) of northern South America. This curious bird is somewhat smaller than a Pheasant, with a long, thin body, fairly long neck, short, rounded wings with ten primaries, and a long tail of ten stiff feathers. Its strong bill, whose upper mandible has serrated edges, is surrounded by bristles; its eyelids are furnished with lashes; its legs are short and stout and its feet large. In

both sexes the plumage is olive-coloured with white markings above and dull rufous below; a long, loose crest on the head and the tip of the tail are yellowish; round the eyes the naked skin is bluish-black. From its strong musky odour it is known in Guiana as the "Stink-bird."



(F. W. Bond.)

HOATZIN (*Opisthocomus hoazin*).

The fame of this bird is mainly due to the fact that its chicks have functional claws on two digits of the wings—a very reptilian character.

The Hoatzin lives in trees on the borders of rivers or lagoons, feeding on leaves and fruits, and having an enormous "crop," larger than in any other bird. Its note is a hissing screech. It flies heavily for short distances and hops and scrambles about among the branches. Its nest is a loose platform of sticks, and the eggs, from three to five in number, are yellowish-white with reddish and lilac spots. The young are covered with scanty reddish-brown down and can see, run, climb, dive and swim as soon as they are hatched. The digits of the wing corresponding to the thumb and first finger bear hooked claws, which the nestling uses in addition to its bill and feet in climbing about the branches until it can fly.

Order GRUIFORMES (Bustards, Rails, Cranes, etc.)

The members of this Order are usually moderate-sized or large birds with fairly long necks and legs and with feet in which the hind toe, when present, is at a higher level than the three front ones. A considerable proportion of the species frequent swamps and reed-beds and most of the remainder are strictly terrestrial. Representatives of the Order are found in all parts of the world, but the total number of species included in it is comparatively small. They are undoubtedly the remnants of an ancient group of birds and the survivors differ much in structure.

Family Mesoenatidae (*Roatelos*) contains only three species, and these are peculiar to Madagascar. They have rather long, slender, somewhat curved bills; rounded wings with ten primaries; moderately short tails of twelve broad feathers; rather weak legs; and large feet with three toes in front and one behind, all at the same level, with small nearly straight claws.

Family Pedionomidae contains only the Plain-wanderer (*Pedionomus torquatus*), which inhabits inland districts in south-eastern Australia. It is a small, quail-like bird, seven inches long, with short bill, short, rounded wings, short tail, rather long legs, and feet with four toes, of which the hind one is short. The plumage is reddish-brown above, buff below, more or less barred with black. The female, which is rather larger and more brightly coloured than the male, has a broad white collar, spotted with black, round the neck; in the male the collar is brown and buff. Plain-wanderers run rapidly over the open grassy country which they frequent, but their flight is feeble and they do not take wing at all readily. Their nest is a mere hollow in the ground, and the four or five pear-shaped eggs are yellowish or greenish-white, spotted and blotched with olive and grey.

Family Turnicidae (*Button-quails* or *Hemipodes*) includes about fourteen species of small terrestrial birds found in southern Europe, Africa, Arabia, southern Asia, the Malay Archipelago, Australia and New Caledonia. They have short bills; broad, rather short wings with ten primaries; short tails of twelve feathers; long, slender legs; and feet with only three toes, which have small, curved, sharp claws. Their plumage exhibits black, brown, chestnut, buff and white tints. In some species the sexes are similar, but in the majority the female is larger and more brightly coloured than the male, whose plumage resembles that of the young. It is stated that the male incubates the eggs and cares for the chicks.

Button-quails, also known as Bustard-quails or Hemipodes, frequent grassy plains or bushy thickets, running strongly but flying with reluctance and only for short distances. Their food consists of seeds and insects. Their nests are hollows in the ground lined with dry grass and sometimes also partly domed with grass. The three to five pear-shaped eggs are buff or grey with spots of grey, purplish or brown. The young run as soon as they are hatched.

CRANES (GRUIDAE)

Family **Gruidae** (*Cranes*) includes about sixteen species of very large birds found in North America, Europe, Africa, and Asia, with one species in Australia. They have straight, somewhat-compressed bills; long necks; large, rounded wings with eleven primaries; short tails of twelve feathers; very long legs; and feet with four toes, of which the three front ones are stout and more or less connected by webs at the base, whilst the small hind one is raised and has a sharp claw. In most of the species the plumage is largely grey, but some are almost entirely white and several have patches of black, white or other colours. Several species have long ornamental plumes on the neck or back; the Crowned Cranes (*Balearica*) have remarkable tufts of wiry feathers on the top of the head; the majority have part of the head bare of feathers, the skin being covered with papillae usually red in colour; whilst a few have fleshy wattles on the throat.

Cranes inhabit open plains and morasses, feeding on seeds, plant-shoots, bulbs, etc., with the addition of worms, reptiles, frogs, small mammals and large insects. Except

when breeding, they are commonly found in flocks, and they frequently indulge in remarkable dances with their wings outspread, bowing to one another, leaping in the air and performing various other antics. They are among the largest birds capable of flight and usually run for some distance flapping their wings before rising from the ground.



[D. Seth-Smith.]

DEMOISELLE CRANE (*Anthropoides virgo*)

This graceful bird breeds in eastern Europe and northern Asia and winters in north-east Africa and southern Asia.

AVES (ORDER GRUIFORMES)



Those which breed in northern latitudes migrate to the tropics for the winter, flying in flocks at great altitudes and only occasionally alighting on the journey. Their loud, trumpeting notes are uttered during flight as well as on the ground. The nest is always on the ground, sometimes merely a hollow, in other cases a large pile of vegetation in a swamp with a small hollow at the top. The eggs are two, or rarely three, creamy, buffy or bluish-white, usually with reddish-brown and purplish spots and blotches. The nestlings are clothed in tawny down and can run soon after they are hatched.

Family Aramidae (*Limpkins*, *Courlans*, *Crazy Widows* or *Lamenting Birds*) contains only one species, found in South America, Central

By courtesy of] [Carl Hagenbeck's Tierpark, Stellingen.
 KAFFIR CRANE (*Balearica [pavonina] regulorum*).
 This is the South African representative of the Crowned Cranes, remarkable for the spreading tuft of twisted bristles on the head.

COURLANS AND TRUMPETERS

America, Florida and the West Indies. They have long, slender, compressed bills, which are very hard and usually bent slightly sideways at the tip; their wings are short and rounded, with eleven primaries; their tails short; and their legs and toes long. Their plumage is glossy olive-brown, striped with white on the head and neck, more bronzy on the wings and tail. They frequent swamps and the borders of wooded streams.

during the day-time perching in trees, but at evening descending to the ground or the water-side in search of mussels, snails and slugs. These they carry to favourite feeding grounds, where they hold them with their feet while they break the shells with blows from their powerful bills till they can drag out the mollusc. They fly heavily with the legs dangling. Their notes are loud wails and clucking calls, the latter having earned for the northern form in Jamaica the name of "Clucking Hen." The nest is a rather large structure, generally placed in a tussock, and the four to ten eggs, large for the size of the bird, are buff, spotted and blotched with

brown and grey. The young are covered with dense brown down.

Family Psophiidae (*Trumpeters*) includes three species found in tropical South America. Their bills are short, stout and somewhat curved; their heads small; their necks rather long; their wings short and rounded, with ten primaries; their tails short; and their legs very long. The plumage is mainly black, often with metallic sheen on the feathers of the neck, and in most species there are patches of lighter colour on the wings. Trumpeters frequent moist forests, where they are often found in flocks.



[D. Seth Smith.

GREAT COURLAN (*Aramus vociferus*).

Courlans feed mainly on molluscs, whose shells they break with their powerful bills.

AVES (ORDER GRUIFORMES)

They run swiftly and can swim, but rarely fly. The ranges of the various species are separated by the great rivers, different species occurring on the opposite banks of the Amazon, Rio Negro, etc., so that it would appear that they cannot cross wide stretches of water. Their name is derived from their loud, deep-toned cry, which is uttered with widely-opened bill. They lay creamy- or greyish-white eggs.

Family Rallidae (*Rails and Coots*)

This family includes a large number of species found in all parts of the world. They are small or moderate-sized birds, the great majority of which



frequent reed-beds or dense vegetation in damp localities, and their bodies are very much compressed, enabling them to traverse the narrow passages between the plant-stems. The bill is stout, but varies much in length; in many species a horny shield is present on the lower part of the forehead, extending upwards from the base of the bill. The wings are generally short and rounded, and in a considerable number of the insular species, they are too small to support the bird in the air. The legs are generally fairly long and in some of the terrestrial forms they are extremely stout. The toes are long and slender and have sharp, curved claws; in the Coots the front toes have broad lobes of skin along the edges.

MOORHEN (*Gallinula chloropus*).

(L. J. Langford.

Also called Waterhen, this species is found on almost every pond in England.

RAILS AND COOTS



(T. M. Fowler)

CORN CRAKE (*Crex crex*)

The Land Rail, as this bird is often called, frequents meadows and cornfields, constantly uttering its "craking" note.

Rails are generally skulking birds, which run swiftly to cover when disturbed, have considerable difficulty in rising from the ground or the water, and fly heavily with continuous wing-beats. Nevertheless, many species are migratory and annually traverse great distances of land and sea. Most of the species swim readily and the Coots are almost completely aquatic, obtaining much of their food by diving. Their food consists of worms, molluscs, insects, green herbage, roots and aquatic plants and seeds. They make curious harsh calls and notes, chiefly heard from the reed-beds at dusk. Their nests are usually built close to water and constructed of aquatic plants, reeds, sedges, etc. The eggs vary in number from two to ten or more and are commonly buff with reddish or black markings. The young when hatched, are covered with down, which is commonly black, and leave the nest almost at once, running and swimming readily.

Land Rail or Corn Crane (*Crex crex*). This bird has the plumage of the upper parts mainly yellowish-brown, each feather having a dark centre; the underparts are buffish-white with broad buff and brown bars on the flanks. In summer it is widely distributed in Europe and western and central Asia, wintering in Africa and Arabia. It was formerly common in summer almost everywhere in the British Isles, but in recent years has rapidly

AVES (ORDER GRUIFORMES)

become scarce in southern and eastern England. Unlike most Rails, it is not a frequenter of swampy localities but is found in meadows and corn-fields. Its note is a constantly-repeated "crake," uttered almost continuously towards evening.

Spotted Crake (*Porzana porzana*). This is a smaller bird than the Corn Crake and is also a summer visitor to the greater part of Europe and western Asia, wintering in the countries round the Mediterranean and in northern India. It is a very shy bird, living in dense reed-beds and is consequently rarely seen. Its plumage is mainly olive-brown, with small white spots, but the flanks are barred with brown and white, the belly grey and the under tail-coverts buff.

Water Rail (*Rallus aquaticus*). This bird is found in swamps throughout Europe and Asia and is only partially migratory. In the British Isles it is probably commoner in winter than in summer, and is certainly most often seen when frosts force it to leave the shelter of the reeds in search of food. Its most conspicuous feature is its long red bill; the plumage of the upper parts is olive-brown, streaked with black, and of the underparts grey with black and white bars on the flanks.

Waterhen or Moorhen (*Gallinula chloropus*). The Moorhen is found in suitable localities throughout Europe, North Africa, Asia, North, Central and South America. Its upper parts are chiefly dark olive-brown; the



COOT (*Fulica atra*).

[Arthur Brook.

More aquatic than the other Rails, each toe being separately webbed.

COOT, FINFOOTS, KAGU



[D. Seth-Smith.]

SUN-BITTERN (*Eurypyga helias*).

This native of Brazil and Guiana is here seen displaying its wonderfully mottled plumage.

head, neck and underparts dark grey, with conspicuous white patches on each side below the tail. The adult has the tip of the bill yellow, the base and a broad plate on the forehead red ; the legs are greenish-yellow with red bands at the joints. It frequents marshy pools, ponds and streams swimming well with a constant nodding motion of the head. It also dives freely, using its wings under water.

Common Coot (*Fulica atra*). This bird is found throughout Europe, North Africa, Asia and Australia. Its plumage is dark slaty-grey above and sooty-black below ; the horny plate on the forehead being white. It frequents large ponds and lakes, and in winter often congregates in great flocks on the larger sheets of water.

Family Heliornithidae (Finfoots) contains only three species, one found in tropical America, one in Africa, and one in the Malay Peninsula and Sumatra. They are rather small birds with fairly stout, straight bills ; small heads ; thin necks ; long, pointed wings with eleven primaries, and a curved spine on the angle ; short legs, twisted outwards ; and toes with short, sharp claws and broad, scalloped webs. They frequent swamps and rivers in jungle country, swimming and diving well and often perching on the boughs of trees overhanging the water. They feed on fish, crustacea, insects and seeds.

Family Rhynochetidae contains only the Kagu (*Rhynochetus jubatus*) found in New Caledonia. It is a bird about the size of a fowl with a large head and very large eyes. The bright red bill is fairly long, flattened and

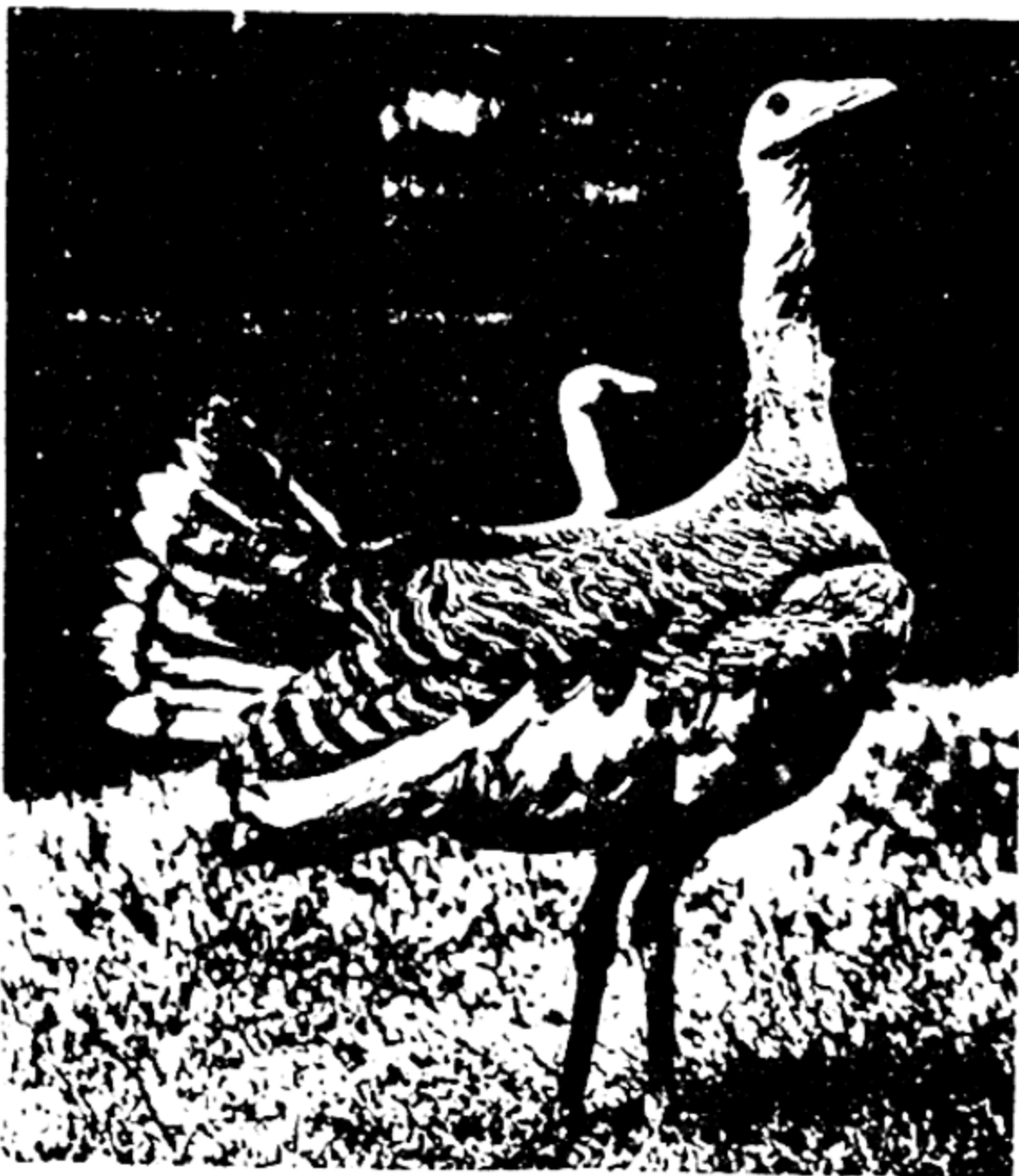
AVES (ORDER GRUIFORMES)

pointed. The wings are broad and rounded, with ten primaries, and the tail of twelve feathers fairly long and also rounded. The red legs and feet resemble those of the Sun-bitterns but are shorter and stouter. The plumage generally is slaty-grey, but when the bird spreads its wings, these are seen to be barred and spotted with white, rusty and black. On the back of the head and neck there is a crest of long, whitish-grey feathers. The Kagu inhabits forested mountain-sides or the neighbourhood of lakes, and is said to be largely nocturnal. It walks quickly in a stately fashion, often pausing and remaining motionless for some time ; it also frequently indulges in strange dances and extraordinary antics, often with the delicate crest-feathers spread round its head. It feeds on insects, worms, snails, etc. Its eggs are reddish-buff with brown and grey markings.

Family Eurypygidæ (*Sun-bitterns*) contains only one species, found in Central America, Colombia, Guiana and Brazil. They have long, rather slender bills with blunt tips ; long necks ; broad, rounded wings with ten primaries ; long, rounded tails of twelve feathers ; fairly long slender legs ; and feet with four toes, of which the three front ones are long and have curved claws. The plumage is variegated, mottled, barred and striped with black, brown, chestnut, bay, buff, grey and white. Sun-bitterns frequent the wooded, swampy banks of large rivers, where they walk quietly about with the body horizontal and the head and neck outstretched. They feed on small fish, insects, etc. At times, they execute fantastic dances when the broad wings and tail are spread in semi-circles

almost concealing the body and displaying their intricate, moth-like colour patterns. The nest of sticks and mud is placed on low branches and the eggs are reddish-buff with brown and grey markings. The nestlings are covered with mottled down, and remain for some time in the nest.

Family Phororhachidæ includes a number of species of extinct birds found in the Miocene beds of Patagonia. *Phororhacos*, a genus of which several species have been described, had an enormously large and heavy head with a very deep bill ; the upper mandible ended in a strong hook and the lower curved upwards to meet it. The wing was well-developed, but too small to be



(Will F. Taylor.)

GREAT BUSTARD (*Otis tarda*).

Formerly an inhabitant of Salisbury Plain and East Anglia, but exterminated in England about 1838.

CARIAMAS AND BUSTARDS

capable of lifting the bird, and the tail was long. The legs were long and fairly stout and the hind toe was present. *Brontornis burmeisteri*, the largest known member of the family, probably stood about seven feet high. The head of this great bird was not so large as in other species and its legs were shorter but stouter.

Family *Cariamidae* (*Cariamas*) contains only two species found in Brazil, Paraguay and northern Argentina. They have short, broad, rather hooked bills ; rather long necks ; short, rounded wings with ten primaries ; long, rounded tails of twelve feathers ; long legs and four toes with sharp, curved claws. Their plumage is brownish-grey above marked with zig-zag



[D. Seth-Smith.
GREAT BUSTARD (*Otis tarda*).
A cock bird displaying, a performance accompanied by a booming note.

bars and whitish below with brown stripes. Tufts of feathers spring from the sides of the face in front of the eyes forming a sort of crest. They stalk about on plains or in open forest country, and towards dusk make loud screaming calls. They build nests of sticks in low trees or bushes or on the ground and lay two pale eggs, blotched with reddish-brown. The downy young leave the nest soon after hatching.

Family *Otididae* (*Bustards*) contains about thirty species of large or moderate-sized terrestrial birds peculiar to the eastern hemisphere. They have rather short, blunt, curved bills ; flattened heads ; thick necks ; broad, rounded wings ; fairly long, rounded tails ; stout legs ; and feet without a hind toe. The three front toes are short and stout with flat soles and flattish nails. Bustards inhabit plains, steppes and deserts, where they stalk about or run rapidly. Their plumage is usually mottled with tints of brown, black and buff, the males, which are larger than the females, generally having tufts of ornamental plumes on the head and neck. In several species the adult males can inflate a pouch on the fore neck with air, whilst at the same time they spread out their neck plumes, depress their wings and raise their fan-shaped tails, strutting about like Turkey-cocks and making booming noises. Bustards are omnivorous feeders. They deposit from two to five eggs in a hollow in the ground. The ground colour of the eggs is of various shades of brown or greenish and they are marked with purplish or dull red. The nestlings are covered with mottled down.

Order DIATRYMIFORMES

A group of extinct birds, of which several species are known from the Eocene rocks of North America. One of them, *Diatryma steini*, from the lower Eocene of Wyoming, is one of the few fossil birds found that is represented by a nearly complete skeleton. It was a gigantic terrestrial bird standing about seven feet high and, though not as tall as an Ostrich, was heavier in body. It had a massive head and neck, with a great arched, compressed bill; its wings were very small, so that it was certainly incapable of flight; its legs were very strong; and its feet had three strong toes in front and a small hind toe at a higher level.

Order CHARADRIIFORMES (Plovers, Gulls, Auks, etc.)

A very large group of birds, represented in all parts of the world, whose members exhibit great differences in external appearance and habits, but are similar in anatomical characters.

There are three Suborders: *Charadrii* (Plovers, etc.), *Lari* (Gulls, etc.) and *Alcae* (Auks, etc.).

Suborder CHARADRII

Family *Jacanidae* (*Jacanas*) includes about seven species of rather small aquatic birds found in tropical and sub-tropical regions of both hemispheres. They have moderately long, straight bills with a fleshy lobe or "leaf" rising from the base; their wings have a horny spur developed on the angle; their legs are rather long and their toes are excessively long with extremely long claws. They frequent lakes, lagoons and sluggish rivers, running over the leaves of water-lilies and other aquatic plants with ease, since their weight is distributed by their long toes. Their nests are slight structures of water-weeds built on floating vegetation and their eggs, usually four in number, are deep brown, with black scrawl-like markings all over them, and extremely glossy.

Family *Haematopodidae* (*Oystercatchers*) includes about ten species of large wading birds distributed over the sea-coasts of the world. They have very long, hard, compressed bills, which are much deeper than they are broad at the end, with the tip rounded or truncate in profile (not pointed). Their legs are fairly long and very stout, the hind toe is absent, and the three short, stout front toes are partially connected by webs at the base. The plumage is either black and white, or entirely black, or sooty brown, and the bill and legs usually red, sometimes orange or yellow. Oystercatchers feed on mussels, limpets and other molluscs, which they detach from the rocks and split open with their powerful chisel-shaped bills, or on cockles, clams, etc., on sandy beaches, as well as on shrimps and sand-worms. Their nests are mere hollows on sand-hills or rocks, and they lay from two to four, usually three, eggs, yellowish with black and grey spots and blotches. The young are covered with mottled down, and can run soon after hatching.



[W. Bickerton.

PIED OYSTERCATCHER (*Haematopus ostralegus*).
Often appropriately called the Sea-Pie, from its black and white plumage.



[B. W. Cooper.

LAPWING (*Vanellus vanellus*).
Also known as Green Plover or Peewit, from its note.

AVES. (ORDER CHARADRIIFORMES)

Pied Oystercatcher (*Haematopus ostralegus*). This is found on sea-coasts in most parts of the world, but is absent from those of tropical Africa, much of tropical Asia, and the island groups of the tropical Pacific. In many parts of its range it is strictly confined to the sea-coast at all seasons, but in Scotland, many parts of Europe, and Siberia, it is found on the shores of freshwater lakes and rivers, and even in wet fields and grass-land at a distance from any considerable watercourse. The head, neck, upper breast, upper back, shoulders, wing-quills and tail are black, the rest of the plumage white, the bill orange-vermilion and the legs pinkish-red.

Family Charadriidae (*Plovers and Turnstones*)

This family includes seventy or more wading-birds, distributed throughout the world. They have comparatively short bills, hard at the tip but softer at the base; fairly long legs; three toes in front, occasionally united by webs at the base, and the hind toe small or sometimes absent. They frequent sea-coasts, damp meadows, moors or open plains, and feed largely on snails, slugs, crustacea and insects. They run swiftly and their flight is usually rapid. Their nests are often little more than hollows slightly lined with grass, and they usually lay four pear-shaped greenish or buff eggs with darker markings. The downy young can run almost as soon as it leaves the egg.

Lapwing, Green Plover or Peewit (*Vanellus vanellus*). This is a very plentiful species in the British Isles and is found in summer right across Europe and northern Asia, many moving south to the Mediterranean countries, Persia and northern India for the winter. Its back and wings are bronzy green; the face, breast, wing-quills and tip of the tail, black; the sides of the head, underparts and most of the tail white, with the tail-coverts rufous. It has a long, slender greenish-black crest of curved feathers. The wings are extremely rounded at the tips and the flight is curiously flopping, the birds often tumbling in the air. The name Peewit is derived from the constantly-uttered cry.

Dotterel (*Eudromias morinellus*). This bird breeds on the tundras of northern Europe and Asia and in elevated regions further south, including the highest ranges of Scotland and northern England, wintering in the Mediterranean countries, Arabia and Persia. The plumage exhibits various shades of grey, brown and reddish, the most striking feature being a broad white band extending over each eye and round the nape.

Kentish Plover (*Charadrius alexandrinus*). This is one of the smallest members of the family, with sandy-brown upper plumage, rufous crown, white forehead, neck and underparts, and a black patch on each side of the breast. It is found on sea-coasts, sand-plains and the shores of salt-lakes in almost all the warmer parts of the world, but in the British Isles is only a summer visitor to the coasts of Kent.

PLOVER AND TURNSTONE

Ringed Plover (*Charadrius hiaticula*). This Plover is a more northern bird than the preceding, breeding on sea-shores in the Arctic and northern portions of both hemispheres. It is common on the coasts of the British Isles. It is brown above, with white forehead, neck and underparts, some black on the head and a broad black band across the breast. Its legs are orange-yellow.

Golden Plover (*Pluvialis apricaria*). This bird breeds on the tundras and northern moorlands of Europe and western Siberia, including the British Isles. In summer the upper parts in both sexes are blackish-brown, profusely spotted with yellow, whilst the throat, breast and underparts



[Arthur Brook.]

GOLDEN PLOVER (*Pluvialis apricaria*).
Breeds on the moorlands of Scotland, Ireland, Wales and northern and western England.

AVES (ORDER CHARADRIIFORMES)

are black. In winter the underparts are white and the upper parts yellower. At that season it is found on sea-coasts of the Mediterranean countries and western Europe, including the British Isles, as well as in fields and pastures inland, usually in considerable flocks.

Grey or Black-bellied Plover (*Squatarola squatarola*). Like the Golden Plover, this has the underparts black in summer and white in winter, but the axillary feathers of the wing are always black. The upper parts are mottled and barred with brownish-black and white. It is a larger bird than the Golden Plover, and in the breeding season is confined to the tundras and barren grounds of Siberia and North America, but in winter is found on sea-coasts almost throughout the world.

Turnstone (*Arenaria interpres*). This is another species which may be found on almost all the coasts of the world in winter, and breeds round the North Pole. Its breeding range includes Iceland and Scandinavia, North Russia, Siberia and arctic North America. In summer the head, neck, breast and shoulders are mottled with black and white, the mantle is chestnut and black, and the rump and underparts white, in winter the colours of the plumage are duller. The legs are orange-red. The Turnstone delights in rocky coasts, though it is also found on muddy and sandy beaches at times. With its bill it turns over patches of seaweed, stranded objects and small stones in order to feast on the sand-hoppers, worms, etc. thus revealed.

Family Scolopacidae (*Snipe, Woodcock and Sandpipers*)

This family includes eighty or more species of wading-birds, varying greatly in size. The bill is usually long and rather slender. In the Snipe and Woodcocks it is straight and smooth with a soft, sensitive tip; in the Sandpipers either straight or curved, and with the groove in which the nostrils are situated continued almost to the tip. The eyes are usually large and often situated relatively high on the sides of the head; this being most marked in Woodcocks in which the ear is actually in front of the eye. The legs are usually long, the three front toes are sometimes united by webs at the base and the hind toe is either small or absent.

The members of this family frequent sea-coasts, the banks of rivers and lakes or swampy localities. They feed largely on worms, crustacea and molluscs obtained by probing wet ground with their bills. They run swiftly and commonly associate in flocks. Though many of the species are very widely distributed over the world during the greater part of the year, a large proportion breed in the Arctic regions or in high northern latitudes. Their nests are usually placed in tussocks in swampy localities and their eggs are generally four in number, pear-shaped, buffish or greenish with dark markings. The young are covered with down, and can run very soon after hatching.

Common Snipe (*Capella gallinago*). This breeds in suitable localities



[Stanley Crook.]

COMMON SNIPE (*Capella gallinago*).
With its extremely long, sensitive bill the Snipe probes swampy ground for its food.



[Arthur Brook.]

WOODCOCK (*Scolopax rusticola*).
Its wonderfully mottled plumage makes the Woodcock almost invisible in its woodland haunts.

AVES (ORDER CHARADRIIFORMES)

throughout the temperate and sub-Arctic regions of the northern hemisphere, many migrating south to the tropics in winter. Its plumage above is mottled and barred with black, brown, rufous and buff, the breast buff streaked with brown and the underparts white. During the breeding season both sexes produce a remarkable "drumming" or "bleating" sound while on the wing. This is due to the rapid vibration of the outer tail-feathers,



[B. W. Cooper.

CURLEW (*Numenius arquatus*).

The wild calls of this wary bird are characteristic of the wilder parts of the British Isles.

which are spread out from the rest and held rigid during the bird's headlong descent from a considerable height.

Jack Snipe (*Lymnocyptes minima*). This is similar in coloration to the Common Snipe, but considerably smaller. It breeds in Scandinavia, north Russia and Siberia, and in winter is found in the British Isles, southern Europe, northern Africa, Mesopotamia, Persia and India. It frequents swampy localities like its congener, but is less sociable, and when flushed usually rises silently and only flies a short distance before pitching again.

Woodcock (*Scolopax rusticola*). This breeds throughout most of

Europe and northern Asia, large numbers migrating southwards for the winter. The plumage of the upper parts is rufous-brown, barred and freckled with grey and black, the underparts being lighter. During the daytime the birds rest among grass or under bushes in wooded country, and at dusk fly to swampy localities to feed. In the breeding season the birds indulge in curious nuptial flights at dusk, flying with slow, steady wing-beats over an oval or triangular course, and following precisely the same course night after night. During this flight, sometimes called "roding," the bird makes most curious chuckling and squeaking sounds. The Woodcock is also

SNIPE AND CURLEW

unique among birds in having the ear-opening in front of the eye. This is, perhaps, an adaptation to enable it better to hear the movements underground of worms, on which it feeds by thrusting its very long bill into soft ground.

Curlew (*Numenius arquatus*). In Scotland this is called the Whaup. It is the largest European member of this family, and has a long curved bill. Its upper plumage is pale brown marked with darker streaks, its rump white and its undersurface whitish with dark streaks on the neck and breast. It breeds on moors and in upland pastures in most parts of the British Isles where such habitats occur, and throughout the greater part of northern Europe and western Siberia. In winter, it chiefly frequents sea-coasts, especially muddy estuaries, congregating in large flocks, and at this season its range extends to the Mediterranean and the coasts of Africa. It is a very wary bird, and when alarmed utters the loud call-note "cour-lie," which has given it its name in many languages.

Whimbrel (*Numenius phaeopus*). This resembles the Curlew in colouring except that the crown of its head is dark brown with a pale median stripe. It is also much smaller. It has a more northerly breeding range than its larger relative, nesting in Iceland, Scandinavia and northern Russia, also in the Faeroe Isles, and, in small numbers, in the



(D. Seth-Smith.
WHIMBREL (*Numenius phaeopus*).
As a breeding species in the British Isles almost confined to the Shetlands.

Shetlands and Orkneys and north-western Highlands. In the British Isles it is chiefly known as a spring and autumn passage-migrant on the coasts.

Bar-tailed Godwit (*Limosa lapponica*). This breeds in northern Scandinavia, Russia, Siberia and Alaska and winters south to Africa, India and Australia. Large numbers appear on the coasts of the British Isles on migration and many spend the winter feeding on mud-flats in estuaries and bays. In winter plumage the upper parts are greyish-brown, the tail-coverts white with dark bars and the underparts mainly white. The very long, almost straight, bill is pinkish-brown at the base and darker at the tip. In breeding plumage the head, neck and breast are chestnut-red.

Black-tailed Godwit (*Limosa limosa*). In winter this bird is ashy-brown above and greyish below, with a white bar in the wing, a conspicuous

AVES (ORDER CHARADRIIFORMES)

white rump, and the tail-feathers with broad black tips. In summer, the head, neck and breast are reddish-fawn in colour. This species breeds from Belgium and Holland across Europe and Asia to Mongolia and winters in the tropics. It formerly nested in some of the eastern counties of England, but now only occurs in the British Isles on migration.

Knot (*Calidris canutus*). This bird has a much shorter bill and legs than the members of the family described above. In winter its plumage is ashy-grey above with white tail-coverts and underparts, but in breeding plumage the head, neck and breast are chestnut and the mantle blackish marked with chestnut and white. In winter it is found on sea-coasts throughout the world, ranging south to Australia, Africa and Patagonia, though many remain on the coasts of the British Isles. Its breeding-grounds are entirely within the Arctic circle in both hemispheres.



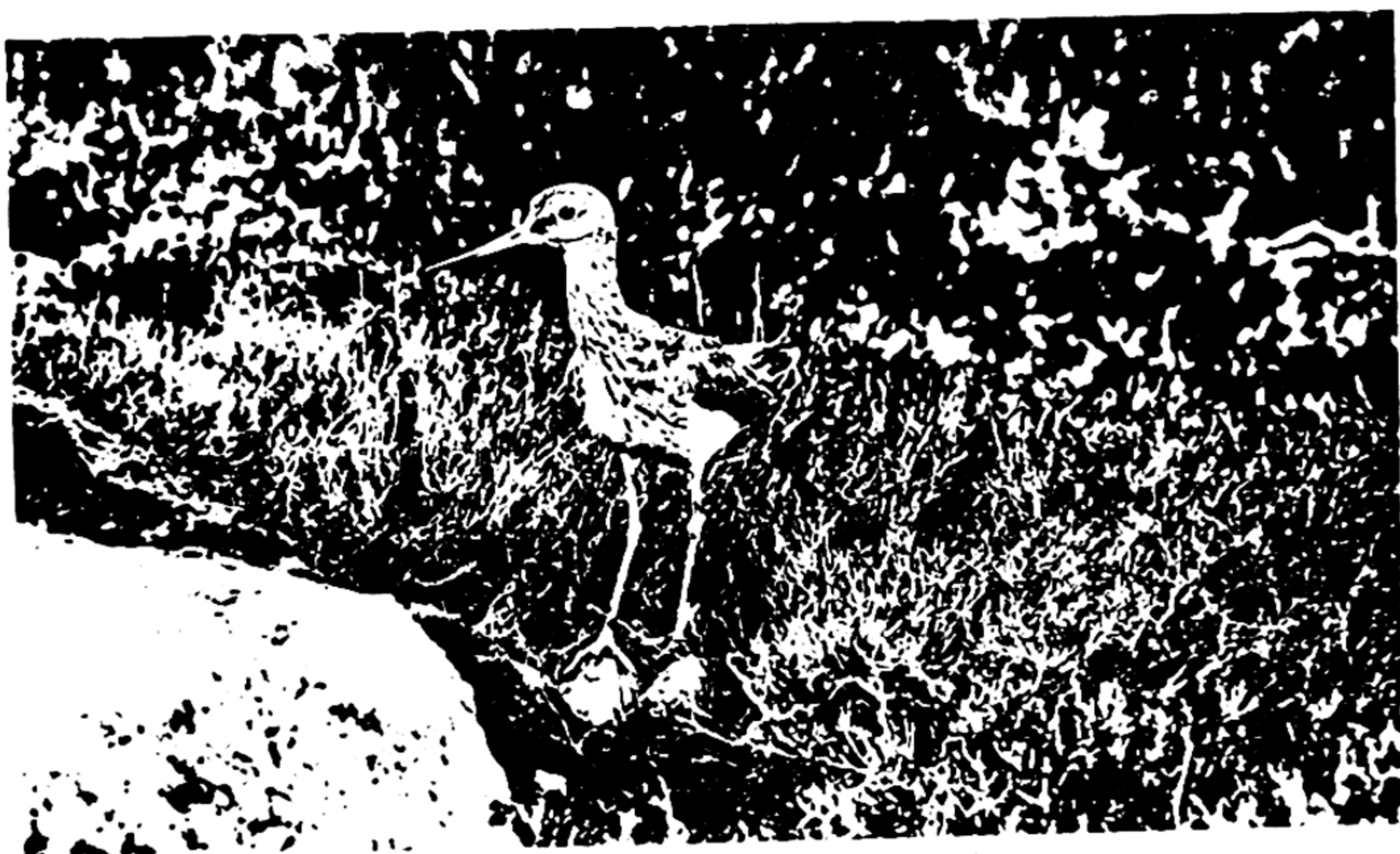
[Capt. H. M. Salmon.]

DUNLIN (*Erolia alpina*).

The commonest wader on British coasts in winter, some remaining to breed on moorlands.

Purple Sandpiper (*Erolia maritima*). This breeds from the Arctic coasts of America, Europe and Siberia south to Iceland, the Faeroe Isles and Scandinavia, moving southward in winter, when it is widely distributed on rocky portions of the coasts of the British Isles. The upper parts are blackish or brownish-grey, somewhat purplish in winter, the throat and breast greyish-brown and the underparts whitish with brown streaks on the flanks. The relatively short legs are ochre-yellow.

Dunlin (*Erolia alpina*). This is in winter the most abundant of the small wading birds often called indiscriminately Stints, Sandpipers or Sand-larks, which occur in flocks, often of large size, on the sandy or muddy parts of the coastline, and feed on the marine worms, crustacea and molluscs exposed at low tide. At that season it is grey above and white below, but in the breeding plumage, which it acquires in spring, its upper parts are variegated with chestnut and black, and it has a large black patch on the



GREENSHANK (*Tringa nebularia*).
This fine wader breeds in small numbers on the moors of northern Scotland.



[Photos]

[Arthur Brook.]

COMMON SANDPIPER (*Actitis hypoleucos*).
Also known as "Summer Snipe," this lively bird frequents streams and lake-sides in the northern and western parts of the British Isles in summer.

AVES (ORDER CHARADRIIFORMES)



[D. Seth-Smith.]

REEVE (*Philomachus pugnax*).

Much smaller than her mate, and lacking the ruff which gives him his name, the plumage of the Reeve is beautifully shaded.

lower part of the breast. It breeds on the moorlands and tundras of northern Europe, Asia and America and is a common nesting species in Scotland, occurring also in small numbers in the breeding season in northern and western England, Wales and Ireland.

Common Sandpiper (*Actitis hypoleucos*). This frequents

the banks of rivers and lakes with gravelly or rocky shores. It breeds wherever such habitats occur in temperate Europe and Asia from the Arctic circle south to the Pyrenees, Carpathians and Himalayas, and is plentiful in summer in most of the hilly regions of the British Isles. Its plumage is bronzy-brown above, greyish on the breast and pure white below. In winter it is found throughout Africa, tropical Asia and Australia.

Green Sandpiper (*Tringa ocrophus*). This has the upper parts greenish-brown, the neck and breast dull white thickly streaked with brown, and the belly and tail-coverts white. In flight it appears nearly black with conspicuously white tail and underparts. It winters in the British Isles, southern Europe, tropical Africa and southern Asia and breeds in northern Europe and Siberia. It frequents streams, ponds and swamps and usually lays its eggs in the deserted nest of some other bird in a tree, sometimes as much as thirty-five feet from the ground.

Redshank (*Tringa totanus*). This is a larger bird than the Common Sandpiper, and breeds in wet meadows, marshes and boggy moors. Its upper plumage is brown in summer, greyish in winter, the tail and underparts are white, more or less barred and streaked with brown, whilst the rump and secondary quills are white. These white areas are concealed when the bird is on the ground, but are very conspicuous in flight, forming a broad band of white round the back of the wings and across the tail. Its long, slender legs are bright orange-red. During summer it is found in suitable localities throughout the greater part of temperate Europe and Asia, and in the British Isles has increased greatly as a breeding species in recent years.

Greenshank (*Tringa nebularia*). This is somewhat larger than the Redshank, greyer in plumage, with a larger area of white on the lower back and

SANDPIPER AND RUFF

none in the wings. Its legs are olive-green and its long bill is slightly upturned. It is a summer visitor to the northern parts of Europe and Siberia, a limited number breeding in the western Highlands of Scotland. In winter it frequents sea-coasts, chiefly in the tropics, though some are found at this season in Ireland.

Ruff (*Philomachus pugnax*). This bird whose female is known as the *Reeve*, is in many respects the most remarkable member of this family. The *Reeve*, rather smaller than a Redshank, has most of the plumage brown, each feather having a pale margin, so that the general effect resembles that familiar in the hen Pheasant. The bill is shorter than in most Sandpipers and the fairly long legs are yellowish. For the greater part of the year the plumage of the Ruff is similar, but he is about a third larger in size. In spring, however, he undergoes a remarkable change. The feathers of his face fall off and fleshy caruncles develop there, tufts of curled feathers sprout on the sides of the head, and a great ruff of strong feathers develops on the front and sides of the neck. These changes take place in a surprisingly short time, and a very remarkable feature is the enormous variety of colouring displayed by these adornments. The feathers of the ruff and of the ear-tufts vary independently and either may be black or chestnut or brown or cream-coloured or white more or less barred with darker colours, so that it is very difficult to find two Ruffs alike in the breeding season.

On arrival at the breeding - grounds each Ruff occupies a small area on which he spends most of his time, a number of birds adopting territories in close proximity. When a *Reeve* appears in the neighbourhood, each Ruff displays his ornamental plumes to the best advantage, posturing, racing and flying about, or indulging in sparring matches with a neighbour. The *Reeve* unconcernedly selects a mate, and it is only rarely that another



[Arthur E. Brough.]

STONE CURLEW (*Burhinus oedicnemus*).
Known also as "Thick-knee" and "Norfolk Plover." This species breeds in open country in southern and eastern England.

AVES (ORDER CHARADRIIFORMES)



[H. N. Southern.

AVOCET (*Recurvirostra avosetta*).

Until about one hundred years ago this handsome bird nested in England in marshy districts from the Humber to the Channel.

Ruff attempts to interfere by an actual attack on the selected candidate.

The species breeds throughout a great part of northern and central Europe and Siberia, and formerly did so in the marshy districts of England. It now only occurs in the British Isles on migration in autumn and spring, on its way to and from its winter quarters in Africa.

Family *Recurvirostridae* (*Avocets and Stilts*) contains about seven species of wading birds with very long, slender bills, either straight or (in the case of the Avocets) curved upwards at the tip; their necks are long and their legs very long and slim; the three front toes are more or less united by webs at the base and the hind toe is rudimentary or absent. Their plumage is

black and white, in one species entirely black, sometimes with patches of chestnut. Members of the family occur in almost all parts of the world, frequenting lagoons, lakes and swamps. Here they wade about seeking for their food, which consists of aquatic insects, crustacea and molluscs picked up from the surface or from near the bottom. To obtain the latter, the head and neck are submerged. When they wish to cross a channel where the water is too deep for wading, they swim readily. They generally breed in colonies near the water's edge, constructing slight nests of grass or weeds, and laying from three to five, usually four, pear-shaped eggs, buff with black or grey spots and markings. The young are covered with yellowish down with dark markings and run or swim within a few hours of hatching.

Family *Presbyornithidae* contains a fossil bird, *Presbyornis*, from the middle Eocene. It seems to have resembled an Avocet, but was probably more aquatic and swam more readily.

Family *Phalaropodidae* (*Phalaropes*) contains three species of small maritime birds, which, except during the breeding season, are found in flocks on the sea, frequently far from land. They have straight, slender bills, rather long necks, very much compressed legs and long toes with lobed, fringing webs. They breed in the Arctic regions and northern

PHALAROPE, CRAB-PLOVER, STONE-CURLEW

latitudes of both hemispheres, often at a distance from the coast, but usually in the neighbourhood of lakes or swamps. In these localities they obtain their food by spinning rapidly round in shallow water, stirring up the mud or weeds and picking out aquatic insects, crustacea and molluscs brought to the surface. The female Phalarope is larger and more brightly coloured than her mate, and she does the wooing and takes the lead in selecting the nesting site. When she has laid the eggs, her part is finished and the male incubates them and raises the brood. The nest is a slight hollow in the ground, lined with a little grass or moss, and the three or four pear-shaped eggs are grey or buff blotched with chocolate or brown. The chicks can run as soon as they are hatched, and are covered with buff-coloured down striped and mottled with black.

Northern or Red-necked Phalarope (*Lobipes lobatus*). This bird breeds in the Arctic and northern regions of both hemispheres, including certain localities in the Shetlands, Orkneys, Hebrides and western Ireland. In summer the female has the head, hind-neck, breast and shoulders grey, the back and wings darker grey, mottled with rufous and with a white bar on the wing, the sides and front of the neck being chestnut and the chin and underparts white. The smaller male has much duller and less well-defined colours on the head and neck. In winter both sexes are much paler, the head, neck and underparts being mainly white, except for a dark streak through the eye.

Family **Dromadidae** contains only the Crab-plover (*Dromas ardcola*), found on the African and Asiatic coasts of the Indian Ocean from Natal to the Andaman and Nicobar Islands. It is a white bird about sixteen inches long, with black back and wings and a grey tail. The bill is straight, hard and compressed and the legs long. It haunts sand-banks and feeds on small crustaceans, and differs most remarkably from all other waders in laying a single large white egg in a deep burrow in the sand. The nestling is covered with grey down and remains in the burrow for a considerable time after it is hatched.

Family **Burhinidae** (*Stone-curlews* or *Thick-knees*) contains



[D. Smit-Smith.
BLACK-WINGED STILT (*Himantopus himantopus*).
The excessively long legs from which this wader takes its name are rosy pink in colour.

AVES (ORDER CHARADRIIFORMES)

about nine species of large terrestrial birds. They have stout bills, big heads, very large eyes, long necks and wings, very long legs and feet with only three toes. Their plumage is mainly brown and buff with markings of black and patches of white. They are found in tropical America and Haiti, and almost throughout the eastern hemisphere, being most numerous in Africa. They chiefly frequent open downs, steppes and plains and are crepuscular in habits. Their food consists mainly of snails, slugs, worms and insects, and they utter wailing cries during the night. They lay on the bare ground two stone-coloured eggs, blotched or scrawled with black, small in proportion to their size.

European Stone-Curlew or Norfolk Plover (*Burhinus oedicephalus*). This bird breeds in India, western Asia, northern Africa, the Canary Isles and southern and central Europe, west to eastern England, where it frequents chalk downs and open heaths from East Yorkshire to Wiltshire and Dorset, being most plentiful in East Anglia. In winter the birds from the northern part of the breeding range move southward and at that season some are found in Devon and Cornwall.



[W. S. Berridge.
TWO-BANDED COURSER (*Rhinoptilus africanus*).
Widely spread in the drier parts of eastern and southern Africa.

Family **Glaucolidae** (*Pratincoles* and *Courser*s) includes a number of terrestrial birds found in Africa, south-eastern Europe, western and central Asia, India, the Malay Archipelago and Australia. They have comparatively short bills, rather long wings, square or forked tails and long, slender legs. Their plumage is commonly sandy or rufous, harmonizing in tint with the soils of the arid regions which they mostly frequent, but the majority have black and white markings, specially on their wings, which are conspicuous in flight. They run swiftly on the ground and feed mainly on insects, especially grasshoppers and locusts. The *Pratincoles* hawk for these on the wing and have a Swallow-like

SEED-SNIPE, SHEATH-BILLS, SKUAS

flight. They lay on the bare ground from two to four eggs, buff or grey with markings of various colours, and the downy young can run within a few hours of hatching.

Family *Thinocoridae* (*Seed-Snipe*) contains four or five species of small, terrestrial birds peculiar to South America. They are found from the Andes of Ecuador and Peru and the high plateaus of Bolivia to the plains of Patagonia and the coasts of the Straits of Magellan and the Falkland Islands. They are plump birds with short, strong, curved bills superficially resembling Partridges when squatting on the ground, but their legs and feet are slender and their wings long and pointed, and when flushed, they rise suddenly and fly with rapid, twisting flight like Snipe, uttering similar sharp alarm-notes. They feed entirely on vegetable matter—seeds, buds and leaves, and can run swiftly on the ground, whilst their mottled plumage harmonizes well with the bare, rocky country which they often frequent. Their nest is a slight depression in the ground, and they lay four pear-shaped eggs, buff thickly speckled with chocolate and purplish. The nestling is covered with light and dark brown down.

Family *Chionididae* (*Sheath-bills*) contains only two species of shore-birds found in the sub-antarctic islands of the Indian Ocean and South Atlantic and on the coasts of the Straits of Magellan. Their plumage is entirely white; their bills short, curved, with a wide gape and a separate horny sheath covering the base of the upper mandible; their wings are long and have a blunt black spur on the angle; their tails, slightly forked; their legs short and their toes not united by webs. They are frequently met with at a considerable distance from land, flying strongly or sailing with outspread wings, but are generally found on rocky coasts, feeding on mussels, crustaceans, sea-weed and the eggs of other birds. The species which occurs in the Falkland Islands is there known as the "Kelp Pigeon," and superficially Sheath-bills have a considerable resemblance to Pigeons. They build nests of dry plant-stems in hollows among rocks or the burrows of Petrels, and lay two or three eggs, buff, thickly blotched with purple or red. The young are covered with grey down.

Suborder LARI

Family *Stercorariidae* (*Skuas*) contains four species of dark-plumaged, long-winged sea-birds breeding in high latitudes in the northern and southern hemispheres, but occurring in temperate and tropical seas during winter. They have stout, hooked beaks, with the basal portion of the upper mandible covered by a separate horny plate. When on land during the breeding season, they feed on small mammals and large insects as well as on the eggs and young of other birds. They also feed on carrion and at sea on any floating animal matter or refuse that they can pick up from the surface. In addition, they attack Shearwaters, Gulls and Terns and force them to give up any food they may have secured. If the victim is pursued on the

AVES (ORDER CHARADRIIFORMES)

wing and drops a fish, the Skua swiftly plunges down and seizes it, in many cases before it reaches the water.

Skuas nest on the ground, laying from two to four eggs in a hollow slightly lined with grass or weeds. The eggs are generally olive-brown with large spots of dark brown or purplish. The young, when hatched, are covered with down, dark brown above, lighter below, and are dependent on their parents for food until they are fledged.

Great Skua (*Catharacta skua*). This is called Bonxie in the Shetlands, and in the northern hemisphere is known to breed only on Iceland, the Faeroes, Shetlands and Orkneys, but in the southern hemisphere it is represented by various races breeding in southern South America, islands in the southern oceans and the Antarctic continent. It is a heavily-built bird, whose plumage is mottled with various shades of brown, with conspicuous white patches in the wings. Outside the breeding season it is



(T. M. Fowler.)

ARCTIC SKUA (*Stercorarius parasiticus*).
Remarkable for the variability of its plumage, some birds being white underneath, others dark above and below.

widely distributed in the North Atlantic as well as in the southern oceans.

Arctic Skua or Parasitic Jaeger (*Stercorarius parasiticus*). This is a smaller and slimmer bird with the two central tail-feathers elongated and pointed. In colouring it is very variable; the top of the head, back, wings and tail are always ashy-brown, but in dark individuals the underparts are almost the same colour, while the light-

est birds have the sides of the head and neck straw-yellow and the chin and breast white. This species breeds in Alaska, Canada, Greenland, Iceland, northern Europe and Siberia, the breeding range including the Shetlands, Orkneys, Hebrides and a few localities in the north of Scotland. In winter it ranges over the oceans south to Argentina, South Africa, Australia and New Zealand.

Family Laridae (*Gulls and Terns*)

This family includes about ninety species of aquatic birds found on sea-coasts in all parts of the world, and frequently also on lakes, swamps and rivers at a distance from the sea. The majority have the plumage in the adult, grey above and white below; in the young, mottled with brown. They have long wings, short necks, and short legs, with webs uniting the three front toes and the hind toe small or absent. The bill is usually nearly straight and rather slender, but is stout and somewhat

GULLS (LARIDAE)

hooked in a few of the larger species of Gulls. Terns feed on small fish, which they obtain by diving from the air, or on large insects. They very rarely settle on water. Gulls, on the other hand, constantly rest on the water and in feeding are largely scavengers, picking up carrion, stranded fish, crabs, molluscs and worms on beaches, as well as garbage and refuse from ships in harbours.



[Gibson & Sons.
GREAT BLACK-BACKED GULL (*Larus marinus*).
 The largest member of its family, breeding on the western coasts of Britain from the Scillies to the Shetlands.

Gulls usually build fairly compact nests of seaweed, grass, weeds or sticks on ledges of cliffs, low islands, sandbanks or beaches, on tussocks in lakes or swamps and occasionally in bushes or trees. Some Terns build nests of seaweed in trees or bushes, but the majority deposit their eggs in a

hollow in the sand or shingle. The eggs are from one to five in number, white, yellowish, brown or greenish in ground colour, generally spotted or blotched with black, brown, reddish, purplish or grey. The young, when hatched, are covered with mottled down, and though they may leave the nest at an early age, are dependent on their parents for food until they can fly. Gulls and Terns are sociable in habits, generally breeding in colonies and associating in flocks on the sea. Their calls



[Arthur Brook.
HERRING GULL (*Larus argentatus*).
 The commonest of the larger gulls on British coasts.

AVES (ORDER CHARADRIIFORMES)



[H. E. Pounds.

KITTIWAKE (*Rissa tridactyla*).

The most maritime of the gulls, not often coming to land except to the cliffs where it breeds.

are usually harsh screams and most species are noisy, especially when breeding.

Herring Gull (*Larus argentatus*). This bird, about two feet in length, is the most widespread and commonest Gull of the northern hemisphere, breeding on the coasts of Europe, northern Asia and northern North America. It has a yellow bill, pink feet and black and white tips to the wings.

Lesser Black-backed Gull (*Larus fuscus*). This is the same size as the Herring Gull, from which it differs in having the mantle dark grey or black and the feet yellow. It breeds on sea-coasts, islands in lakes or moors in northern and western Europe, including the British Isles, and winters on the coasts of Spain and Portugal and in Africa.

Great Black-backed Gull (*Larus marinus*). This is the largest member of the family, about two feet six inches in length, and has a black mantle and pale pink feet. It breeds on both sides of the North Atlantic and is common on the coasts of the British Isles at all seasons.

Mew or Common Gull (*Larus canus*). This in plumage resembles the Herring Gull, but has more white on the wing-tips and is decidedly smaller, about eighteen inches in length. Its bill and feet are greenish yellow. It breeds chiefly on inland lakes, in the British Isles, Scandinavia, Russia, northern Asia, Alaska and western Canada, but frequents sea-coasts in winter.

Black-headed Gull (*Larus ridibundus*). This Gull, about one foot long, is a common and widespread species in the eastern hemisphere. It breeds

GULLS AND TERNS

on swamps and reedy lakes in Europe and northern Asia, and in winter is found on the coasts of Europe, northern Africa and most of Asia. Its bill and feet are red, and in summer the head is dark brown, appearing black at a distance.

Kittiwake (*Rissa tridactyla*). This is the most completely marine of the Gulls, ranging all over the temperate North Atlantic and North Pacific Oceans, and Arctic Seas. It breeds on the ledges of cliffs, often in very large colonies, on the coasts of the Bering Sea, the Gulf of St. Lawrence, Labrador, arctic Canada, Greenland, arctic Europe, the British Isles and northern France. It is a small species, about a foot long, with completely black tips to the wings, yellow bill, black feet and a slightly forked tail.

Common Tern (*Sterna hirundo*). This is found in summer on the coasts of eastern North America, Europe and northern Asia, migrating to tropical coasts for the winter. It is about fourteen inches long, but nearly half this length is that of the deeply-forked tail. Its bill and feet are red, the former with a dusky tip, and the top of the head is black in summer.

Arctic Tern (*Sterna paradisaea*). This closely resembles the Common Tern, but the bill is completely red, the legs are shorter and the streamers in the tail even longer. Its breeding range is more northerly than that of its ally, but overlaps it and in many places in the British Isles they breed together. The Arctic Tern performs the most extensive migration of any bird, as it breeds to within 8° of the North Pole and in the northern winter is found on the coasts of the Antarctic Continent.

Roseate Tern (*Sterna dougalli*). This bird breeds in many localities in the tropical Atlantic, Indian and western Pacific Oceans, and in the temperate



[B. W. Cooper.

BLACK-HEADED GULL (*Larus ridibundus*).

Unlike most other gulls this small species nests in swamps and on the margins of lakes, often far inland.

AVES (ORDER CHARADRIIFORMES)

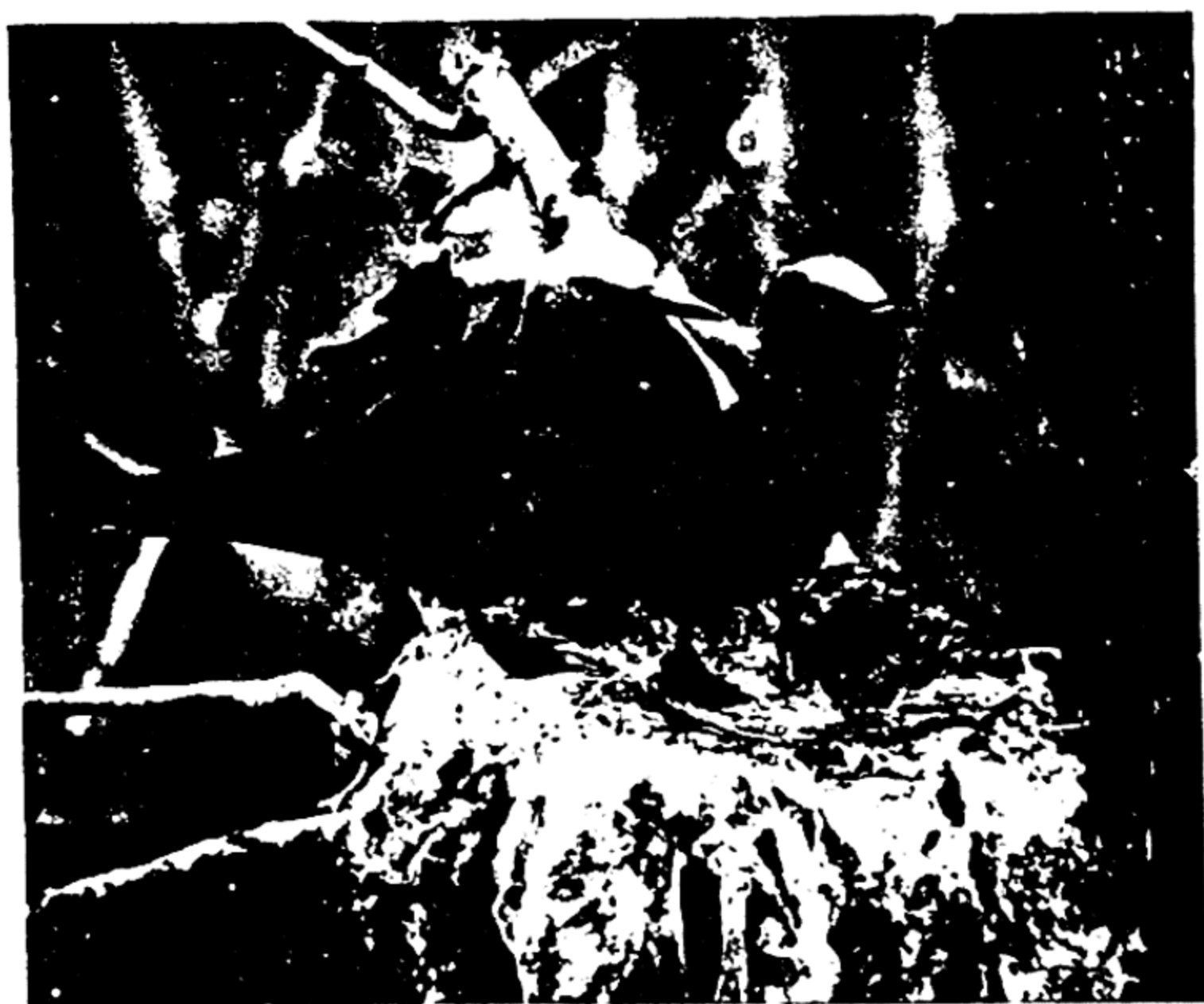
north Atlantic on the coasts of the eastern United States and the British Isles. It is smaller than the two preceding species, with very long tail-streamers, whitish plumage often suffused with rosy on the breast, and bill mainly black.

Little Tern (*Sterna albifrons*). This is the smallest member of the family, has the forehead white at all seasons, the bill yellow with a black tip, and the feet orange-yellow. It breeds in small colonies on sandy beaches on sea-coasts and rivers in almost all the warmer parts of the world and as far north as Massachusetts, the Baltic and the British Isles.

Sandwich Tern (*Thalasseus sandvicensis*). This is a large species with

the black feathers on the head elongated to form a loose crest, the bill black with a yellow tip and the feet black. It breeds on the coasts of the United States and Mexico, the West Indies, and southern and western Europe, including the British Isles, and winters south to Patagonia, the Cape of Good Hope and India.

Black Tern (*Chlidonias nigræ*). Unlike the species mentioned hitherto, this frequents fresh-



[Otho Webb.]

WHITE-CAPPED NODDY (*Anous minutus*).

The tropical terns, called Noddies, build nests of seaweed on the branches of trees.

water lakes and marshes and feeds largely on insects. In breeding plumage the head and neck are black, the mantle and tail slate-grey, the breast and abdomen dark grey and the under tail-coverts white. In winter the breast and abdomen are white and the head white mottled with grey. Its tail is only slightly forked. It usually makes a floating nest among swamp vegetation and breeds in Canada, the United States and Europe south of the Baltic. It formerly nested in several parts of England, but now only occurs on migration. It winters in South America, tropical Africa and north-west India.

Family Rynchopidae (*Skimmers or Scissor-bills*) contains three species of long-winged sea-birds, resembling large Terns, with black or dark brown upper parts and white foreheads and underparts. Their legs are short, their feet small and webbed and their tails moderately forked. Their bills



[1] J. Langford

PUFFIN (*Fratercula arctica*)

This quaint bird with its enormous brightly-coloured bill is known also as Sea Parrot, Coulteruch and Tammy-Norie.

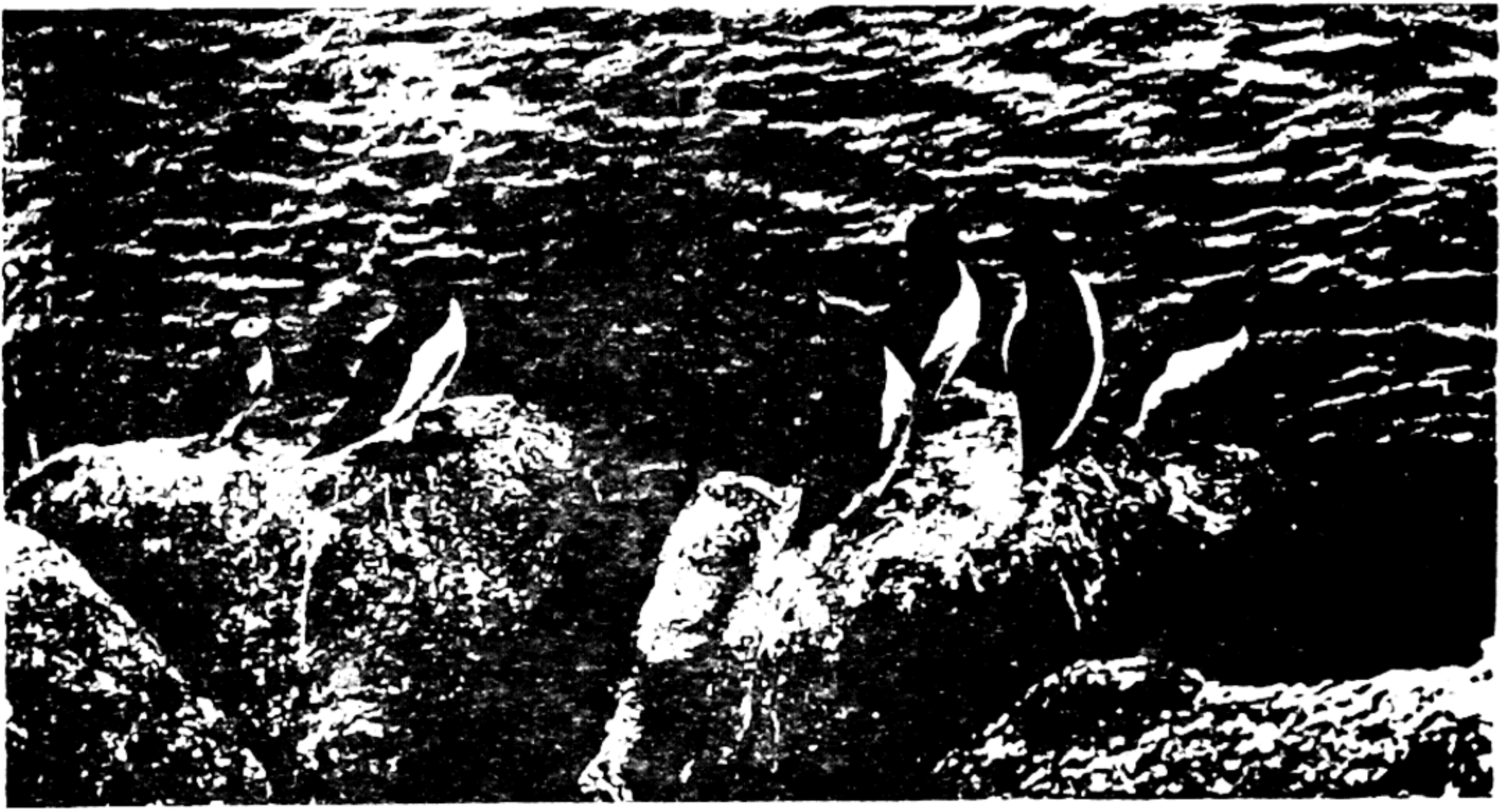


[1] Kershaw

COMMON TERN (*Sterna hirundo*)

These graceful birds breed in colonies on many parts of the coasts of the British Isles

AVES (ORDER CHARADRIIFORMES)



[Gibson & Sons.]

RAZORBILLS (*Alca torda*) AND A PUFFIN (*Fratercula arctica*).
The Razorbill is the nearest living relative of the extinct Great Auk or Garefowl.

are quite unlike those of any other birds. The lower mandible is much longer than the upper one, and both its edges are compressed to a knife-like thinness; the end of the upper mandible is grooved beneath to receive the very sharp lower mandible when the bill is closed. When seeking food, Skimmers fly rapidly just over the water with the bill open and the long lower mandible cutting the surface. By this method they capture small fish and other animals and aquatic weeds. Their fishing is mostly done at dusk or dawn or on moonlight nights, and they commonly spend the hours of daylight resting on sandbanks. They breed in colonies, laying their eggs in mere hollows in the sand. The large eggs, from three to five in number, are whitish or buffy with spots or blotches of brown, chocolate or purple. The young are covered with sandy-coloured down, and have fairly normal bills with which they can pick up objects from the ground, but as soon as they can fly, the lower mandible rapidly elongates. Skimmers are found on the coasts, large rivers and lakes of the warmer parts of America, Africa and India.

Suborder ALCAE

Family Alcidae (*Auks, Guillemots, Razorbills and Puffins*)

This family includes twenty-two species of marine birds confined to the oceans and seas of the northern hemisphere. They are small or moderate-sized birds with short necks, small, narrow wings with eleven primaries and very short tails of from twelve to eighteen feathers. Their legs are short and are placed very far back near the tail, and they have only three toes, which are connected by webs. Except during the breeding season,

AUKS (ALCIDAE)

they spend all their time at sea, usually in flocks, obtaining their food, which consists mainly of fish and crustacea, by diving from the surface and pursuing their prey under water by the use of their wings. Their flight is direct and rapid, their small wings being flapped very rapidly, but they do not fly very far. They congregate for breeding on islands and cliffs, their breeding colonies often containing many thousands of birds, frequently of several species intermingled. They either make no nest, or merely collect some grass and feathers, and deposit one, two or three eggs on ledges of cliffs or in caves, crevices among rocks or holes. Their oval or pear-shaped eggs are very large in proportion to the size of the bird and are either white or variously marked. The young, when hatched, are covered with dark-coloured down, and are dependent on their parents for food till they are fledged. At sea Auks are usually silent, but in their breeding colonies they utter curious growling, moaning and yelping notes. On land they commonly stand upright owing to the posterior position of their feet. Some species stand on the feet only, others rest on the feet and legs.

Great Auk (*Pinguinus impennis*). This was much the largest member of



[J. E. Ruxton.]

GUILLEMOTS (*Uria aalge*).

One of the birds shown has a white ring round the eye and line behind it. Such birds were formerly thought to constitute a separate species called the Ringed Guillemot.

AVES (ORDER CHARADRIIFORMES)

the family, about thirty-three inches long, but its wings were so small that it was quite incapable of flight. Its plumage was black above and white below, with a large white patch on the face. Its bill was long and deep but narrow. It formerly bred on islets near Newfoundland and Iceland and occurred occasionally on the coasts of the British Isles. The two last survivors were captured alive near Iceland in 1844. About eighty specimens exist in museums and nearly as many of its large pear-shaped eggs, which are white or buff with spots and scrawls of black or brown.

Razorbill (*Alca torda*). This obtains its name from its deep and very narrow bill, which is black, crossed by a white band. Its plumage is black above and white below, but in summer the throat and neck are also black and there is a white line from the bill to the eye. It breeds in crevices



[W. J. Clarke.

LITTLE AUK (*Alle alle*).

Also known as Dovekie and Rotge. This little bird breeds in immense numbers in the Arctic regions.

and on ledges of cliffs in the Bay of Fundy, the Gulf of St. Lawrence, southern Greenland, Iceland, Scandinavia, the British Isles and Brittany, and in winter is more often seen near the coasts than other members of the family.

Common Guillemot (*Uria aalge*). This bird has the upper parts sooty brown and the underparts white. Its bill is long, straight and pointed. It

inhabits the North Pacific and North Atlantic Oceans, breeding on the coasts from Alaska, Greenland and Bear Island south to California, Nova Scotia, the British Isles and Portugal. Its single, pear-shaped egg, laid on ledges of cliffs, varies remarkably in colour, no two being quite alike. They may be white, buff, pale-blue or green, mottled, blotched, streaked and scrawled with black, brown, purple or red markings.

Black Guillemot (*Cephus grylle*). This breeds on both sides of the North Atlantic and adjacent parts of the Arctic Sea, south in America to Maine and in Europe to Scotland, the Isle of Man and Ireland. It lays two eggs in crevices among rocks. In summer it is entirely black, except for a large white patch on the wings, in winter the body plumage is white, mottled with black on the upper parts. The bill, which is narrow and pointed like that of the Guillemot, is black externally but vermilion inside, and the feet are vermilion.

GUILLEMOTS AND PUFFINS

Common Puffin or Sea Parrot (*Fratercula arctica*). The Puffin, about twelve inches long, has the upper parts black and the underparts white, with greyish-white cheeks. Its feet are vermilion, and it has a very large triangular bill, greyish-blue at the base, vermilion at the tip, crossed with



[Arthur S. Cook.]

BLACK GUILLEMOT (*Cephus grylle*).

Unlike the larger Common Guillemot, this species nests in holes or crevices and lays two eggs.

lines of yellow. In autumn the horny sheath of the bill is shed in several pieces so that during the winter it is smaller and is not so brightly coloured. The bird inhabits the North Atlantic and adjacent parts of the Arctic Seas, breeding from arctic coasts south to Maine, the British Isles and Brittany. It lays a single white egg with faint brownish or lilac markings in a hole on an island or sea-cliff.

Order COLUMBIFORMES (*Sandgrouse and Pigeons*).

This Order contains a very large number of species and is represented in all parts of the world. The Pigeons and Sandgrouse, though agreeing in a number of internal characters, have few obvious characteristics in common. The birds of both groups, however, have eleven primaries in the wing and generally have the legs, and sometimes the toes, partly covered with feathers. They feed almost entirely on seeds, berries and fruits, and are much more dependent on the presence of water for drinking purposes than are most other birds. In arid regions they make long flights daily to rivers or pools and, unlike other birds, immerse their bills and take continuous draughts, instead of sips.

The three Families contained in the Order are included in two very distinct Suborders :

Suborder Pterocletes : Family *Pteroclidæ* (Sandgrouse).

Suborder Columbæ : Families *Columbidae* (Pigeons and Doves) and *Raphidae* (Dodos and Solitaire).

Family *Pteroclidæ* (*Sandgrouse*) contains about sixteen species inhabiting desert, steppes or arid plains in Africa, southern Europe, western and central Asia and India. They have short, fairly stout, arched bills ; long, pointed wings ; wedge-shaped tails and very short legs. The hind toe is either rudimentary or entirely absent. Their plumage harmonizes with the bare ground on which they live, being various shades of buff or brown, with grey, black, orange and white markings. They associate in flocks and fly swiftly, also running on the ground. The nest is a hollow in the ground and they lay three eggs, whitish, buff or greenish in ground colour with brown, reddish and violet markings.

Pallas's Sandgrouse (*Syrrhaptes paradoxus*) is normally an inhabitant of a large area extending from south-east Russia to Mongolia, breeding in great numbers in western central Asia. From these regions it occasionally migrates into China or into Europe, sometimes in vast numbers. These irruptions have occurred at irregular intervals in the past and their cause is unknown. The birds reached as far west as the British Isles in 1859, 1863, 1872, 1876, 1888, 1890, 1891, 1899, 1904, 1906, 1908 and 1909. The largest invasions were in May, 1863 and 1888, when the birds arrived all along the east coast and spread to all parts of the country. In the years 1888 and 1889, a few actually bred in England and Scotland, though it is not known that they succeeded in rearing any young.

Family Columbidae (*Pigeons and Doves*)

This family contains more than five hundred species, which range in size from the Pigmy Doves of South America, only about six inches long, to the Gouras of New Guinea, nearly as large as hen Turkeys. Pigeons are found in all parts of the world, but their headquarters are the islands of the Malay Archipelago and the South Pacific, where more than half

PIGEONS AND DOVES



[Capt. H. M. Salmon.]

TURTLE DOVE (*Streptopelia turtur*).
Like most pigeons this species makes a very frail nest of sticks.

the species are found. Though the smaller members of the family are commonly called Doves, and the larger ones Pigeons, these names are more or less interchangeable, the largest British species being called both Wood Pigeon and Ring Dove, and the term "Pigeons" must be understood as including all the members of the family. Pigeons have very characteristic bills, the basal portion, in which the nostrils are situated, being covered with soft skin and the terminal portion being hard, arched and somewhat enlarged. Their heads are small and their tails usually rather long and rounded or wedge-shaped, consisting of from twelve to twenty feathers. Their feet have three toes in front and one behind.

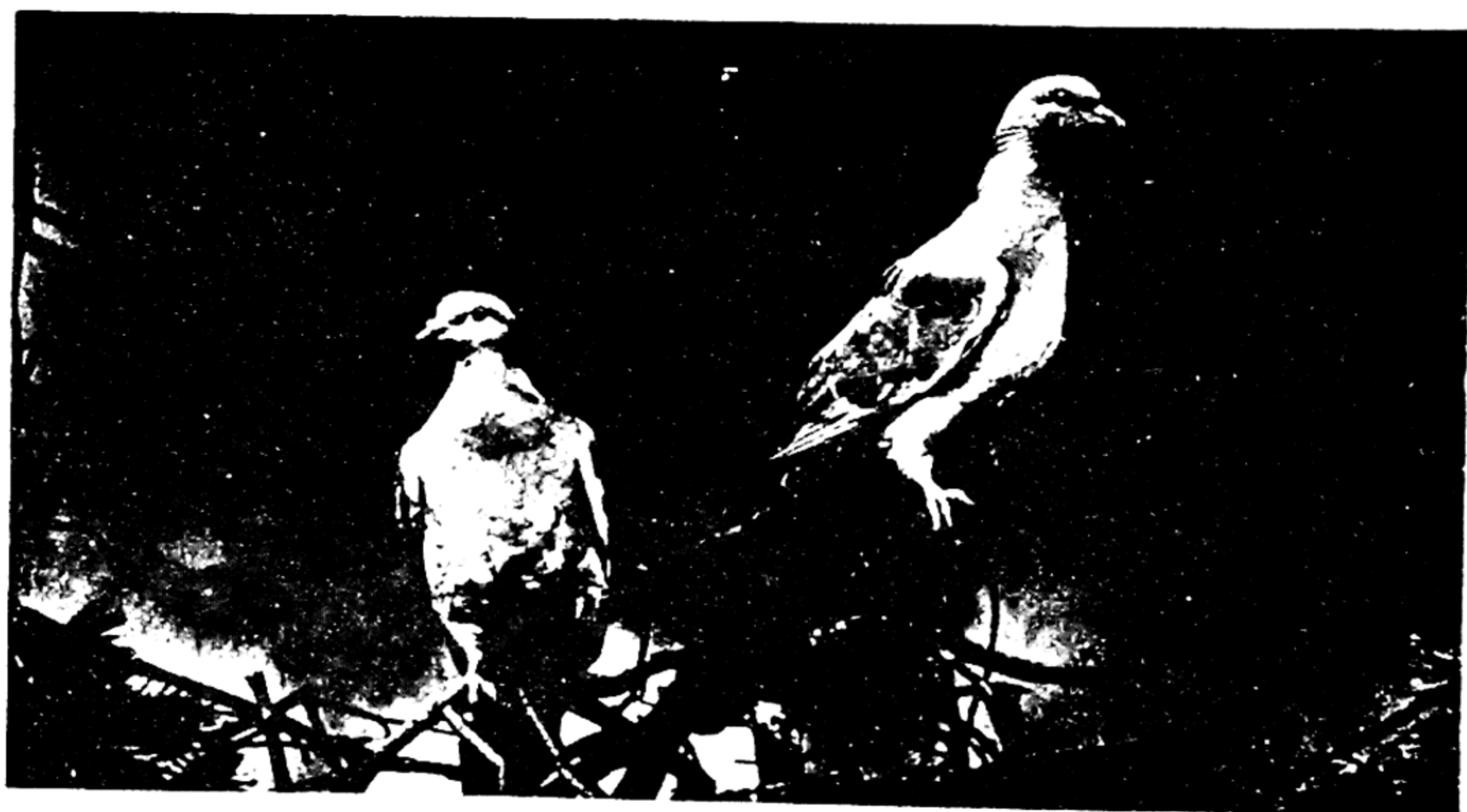
Pigeons are monogamous and probably pair for life, but most species associate in flocks. The majority build frail platforms of sticks, but some lay their eggs on the bare ground or in holes in trees or caves. The eggs are invariably white and almost always two in number. The young, when hatched, are naked, except for scattered hair-like bits of down. They are fed on "pigeon's milk," which is the partly-digested food regurgitated from the crops of their parents. The voice of all Pigeons is a "coo," though the notes of different species vary greatly.

Rock Dove (*Columba livia*). This bird has the plumage generally greyish blue, lighter below, the lower back white or pale grey, two bars across the wing and the end of the tail black. The bill and feet are reddish and the feathers of the neck and upper breast shot with metallic purple and green. It inhabits cliffs on the coast or in mountainous districts in many parts of Europe, north and west Africa, western and central Asia

AVES (ORDER COLUMBIFORMES)

and India. It is the undoubted ancestor of the Domestic Pigeon, which has been bred in captivity from remote antiquity, and under domestication has varied enormously in colour, size and even in structure, at least a hundred and fifty different races having been evolved. Though these breed true, the characteristics of the wild bird soon reappear when the various races are crossed promiscuously, and all the races retain the antipathy of their wild ancestor to perching in trees. The most distinct races of the Domestic Pigeon are : " Pouters," which have long bodies and legs and a very large gullet, which they inflate with air ; " Carriers," which have a long, pointed bill and much carunculated bare skin round the eyes ; " Fantails," which may have as many as forty-two tail-feathers, whilst the wild bird has only twelve ; " Jacobins," which have the feathers of the neck turned forward to form a hood, and long wings and tail ; and " Tumblers," with very short bills and the curious habit of turning back somersaults during flight and even on the ground. " Homers " must also be mentioned, for though in colour and form they have not diverged greatly from the wild stock, constant training and selection has developed in them a wonderful capacity to find their way back to their lofts from great distances, and they are valuable, especially in warfare, for carrying messages, as well as providing a sport which has devotees in many countries.

Wood Pigeon or Ring Dove (*Columba palumbus*). This is a larger bird than the Rock Dove, with patches of white on the wings and the sides of the neck, and the breast vinous-red. It is found throughout Europe, and in western and central Asia and northern Africa. From northern Europe



WOOD PIGEONS OR RING DOVES (*Columba palumbus*).
An abundant species in the British Isles, doing much damage to green crops.

[Charles Reid.

DODOS AND SOLITAIRES

large numbers migrate southward for the winter, and though it is common at all seasons in the British Isles, its numbers are much greater during the winter. It feeds on grain, acorns, berries, etc., and on clover and turnip leaves, and the large flocks do much injury to crops.

Stock Dove (*Columba oenas*). This is a smaller bird than the Wood Pigeon, with which it frequently associates, and its

plumage is entirely grey-blue, except for the brownish-black wing-quills and a blackish bar near the end of the tail. It breeds in holes in old trees or cliffs or in the ground, and inhabits Europe, North Africa and western Asia. In the British Isles it has become much commoner in recent years, and though formerly confined to England, now breeds in many parts of Scotland and Ireland.

Turtle Dove (*Streptopelia turtur*). This is a summer visitor to Europe south of the Baltic, and breeds also in North Africa, and western Asia, wintering in Africa. In the British Isles it is common in summer in the south and east of England and appears to be gradually extending its range to the north and west. It is the smallest European member of the family, and its plumage is predominantly cinnamon-brown with the head, nape and rump grey, and the belly and broad tips to the tail-feathers white.

Family Raphidae (*Dodos and Solitaires*)

This family contains three species of large flightless birds, formerly found in the Mascarene Islands.

Dodo (*Raphus cucullatus*). The Dodo of Mauritius was a clumsy bird as large as a Turkey, with a huge blackish bill terminating in a hook, and short yellow legs, the upper parts of which were feathered. The plumage was dark grey, with the breast and a tuft of curly feathers representing the tail whitish, the short, functionless wings being yellowish white. The Dodo was discovered by the Dutch in 1598, and several living specimens were brought to Europe, but by 1681 it had become extinct, probably due



[W. S. Berridge.]

CRESTED PIGEON (*Ocyphaps lophotes*).
One of the Australian pigeons known as Bronzewing from the patch of metallic feathers on the wing forming a speculum like that of a duck.

AVES (ORDER COLUMBIFORMES)

to the introduction of pigs and other animals into Mauritius. It is said to have laid a single large white egg on a mass of grass.

Solitaire or White Dodo (*Raphus solitarius*). The Solitaire of Reunion was apparently similar in form, but had white plumage varied with yellow. It is mentioned by several travellers who visited the island in the 17th century.

Solitaire (*Pezophaps solitarius*). The Solitaire of Rodriguez was a much more slender and graceful bird than the Dodo. It was larger than a Swan; with an elongated, slightly-hooked beak; a long, straight neck; and more slender, longer legs. The males were larger than the females and were brownish-grey in colour, whereas the latter were of various shades of brown. The males had a spherical mass of bone developed on their rudimentary wings, which they used when fighting, whirling themselves round and making a whirring noise with their pinions. The Solitaire laid a single large egg on a heap of palm-leaves a foot or more high. It became extinct in the 18th century.



[A. M. Willford.

CUCKOO (*Cuculus canorus*).

Two young birds, the lower one fledged, the upper about to be fed by its foster-parent, a Meadow Pipit (*Anthus pratensis*), perched on its back.

Order CUCULIFORMES (Cuckoos and Plantain-eaters)

This Order comprises a large number of small or moderate-sized birds found in all parts of the world. They vary greatly in external appearance, colouring and habits, but have many structural features in common, including a number which they share with the Parrots. The Order contains two Suborders, each containing a single Family.

Family *Musophagidae* (*Plantain-eaters* or *Touracos*) contains about twenty-five species, found in Africa south of the Sahara. They are arboreal, fruit-eating birds of moderate or rather large size, with very small heads, long necks, short round wings with ten primaries and long, broad tails of ten feathers. Their bills are usually stout and broad, with the upper mandible

arched and its edges serrated. Their legs are stout and their toes have strong claws. The outer toe can be turned either forwards or backwards. The plumage is generally metallic-blue or green or greyish-brown, with patches of crimson or yellow. A remarkable feature of the red colouring, which is a compound of copper called turacin, is that it is so soluble that it is washed out of the feathers by rain, or when the bird bathes, but is soon renewed. All the species have erectile crests, and the sexes are similar. They build flat nests of sticks in trees and lay three bluish- or greenish-white eggs.

Family Cuculidae (*Cuckoos*)

The Cuckoo family includes a large number of species found in all parts of the world, though only a few occur in the temperate parts of the northern hemisphere and in New Zealand. The bill varies much in size and shape, but is always compressed and somewhat curved at the tip and has no bristles



[James's Press.]

MACAW (*Ara sp.*).

The Macaws of tropical America, with their enormous beaks, are the giants of the parrot family.

AVES (ORDER CUCULIFORMES)



[W. S. Berridge.
WHITE-CRESTED TOURACO (*Turacus corythaix*).
This brilliantly plumaged bird is known in South Africa as the Knyana Lourie.

at the base. The wing contains ten primaries and the long, rounded or wedge-shaped tail has ten (or eight) feathers. The feet have two toes directed forward and two backward.

The American species of the family build nests of very rude construction, but almost all the Cuckoos found in the eastern hemisphere are parasitic, laying their eggs in the nests of other birds and leaving them to be hatched and the young reared by the foster-parents. The young Cuckoos either throw the other eggs or young out of the nest soon after they are hatched or, by their rapid growth, crowd out or suffocate the young of the other species.

Common Cuckoo (*Cuculus canorus*). This has the head and upper parts greyish-brown and the underparts white, with dusky bars. It is a summer visitor to Europe and northern Asia, wintering in Africa, tropical Asia and the Malay Archipelago. Its striking disyllabic note, from which it derives its name, is first heard in the British Isles about the middle of April, or occasionally somewhat earlier. It is constantly uttered by the cock-bird when perched and when flying in the daytime and sometimes after dark, but about June he "changes his tune" and stutters or becomes hoarse. The female makes a gurgling or bubbling call. Each hen lays from twelve to twenty eggs in a season, normally on alternate days. These she lays or places in the nests of some one other species of bird, unless she is unable to find a nest of this species at the appropriate stage, when she will place the egg in any other nest she can find. Only one egg is placed in each nest and usually one of the eggs of the victim is removed and eaten.

PARROTS AND MACAWS

If two Cuckoo's eggs are found in the same nest, they have been laid by different birds. The species most commonly parasitized by the Cuckoo in England are the Meadow Pipit, Pied Wagtail, Hedge Sparrow, Sedge Warbler and Reed Warbler. The eggs are very small in proportion to the size of the Cuckoo and vary much in colouring, frequently, but not always, resembling those of the species parasitized. When two or three days old, the young Cuckoo, still blind and naked, begins to throw out the other occupants of the nest, eggs or young birds being carried to the edge of the nest in a cavity of the back and then suddenly ejected. Thenceforth the foster-parents devote themselves entirely to feeding the young Cuckoo, which has an insatiable appetite and grows rapidly. The Common Cuckoo, like many other members of the family, feeds largely on hairy caterpillars, which are eaten by few other birds. About August the adults depart for Africa, but the young do not follow till September or October.

Order PSITTACIFORMES (Parrots, Macaws, Cockatoos and Lories)

The Order Psittaciformes contains a very large number of species, almost all of them arboreal, found throughout the world except in the temperate regions of the northern hemisphere. A single species was, until recently, widely distributed in the central and southern United States, but is now restricted to a limited area in Florida. The most characteristic feature of the birds of this Order is the bill, which is short and stout, with both mandibles strongly arched. The upper mandible differs from that of all other birds in being hinged to the skull so that it is movable, and it ends in a hooked point. The lower mandible is truncated and nearly square at the tip.



[W. S. Berridge.

COCKATREL (*Leptolophus hollandicus*).

This little Australian parrot, resembling a diminutive cockatoo, is a favourite cage bird.

AVES (ORDER PSITTACIFORMES)



[James's Press.
GREEN-NECKED AMAZON PARROT (*Chrysotis* sp.).
The South American parrots called Amazons, of which there are numerous species, include some of the best talkers.

The wings have ten primaries and the tail twelve (or fourteen) feathers. The legs are generally short and covered with rough scales, and the feet have two toes in front and two behind. Parrots and their allies use their feet like hands to hold their food, a habit found in few other birds. When climbing about the branches of trees, they use the beak in addition to the feet. In length members of the Order vary from three inches in the Pigmy Parrot of New Guinea to thirty inches in the Palm Cockatoo of the same country. Many of the species are commonly kept in captivity and a considerable number of them learn to talk and to whistle tunes. They frequently live to a great age in confinement. All lay white eggs, usually in holes in trees.

The Order contains two families: *Psittacidae* (Parrots, Macaws and Cockatoos), and *Loriidae* (Lories, Fig-parrots and Nestors).

Family Psittacidae (*Parrots, Macaws and Cockatoos*)

This family contains the majority of the members of the Order and is represented in America, Africa, Asia and Australasia. The birds of this family have the inner side of the hook of the upper mandible file-like, there being a series of parallel transverse grooves on each side. Their tongues are smooth and short, usually thick and fleshy.

Grey Parrot (*Psittacus erithacus*). A native of tropical Africa, this is one of the most familiar cage-birds and probably the most accomplished talker, though individuals vary. It is a large species with the plumage mainly ashy-grey, the primaries black, and the short tail, red.

Blue-and-yellow Macaw (*Ara ararauna*). Like its allies, this bird

MACAWS, COCKATOOS, BUDGERIGARS

- has an enormously powerful beak and the naked, flesh-coloured face is crossed by lines of feathers. This and the other Macaws have also extremely long tails. It is a native of tropical South America.

Sulphur-crested Cockatoo (*Cacatua galerita*). This Cockatoo inhabits northern and eastern Australia and Tasmania, where it is generally found in flocks. It is white, with an erectile crest of long yellow feathers, and there is yellow on the cheeks and beneath the wings. Much of its food is obtained on the ground, where it picks up seeds or digs up roots and tubers.

Cockateel (*Leptolophus hollandicus*). This bird wanders in large flocks over the interior districts of Australia, feeding on seeds of grasses, etc. Its plumage is dark grey, with yellow forehead, yellow and orange cheeks and a white patch in the wings, and it has an elegant crest.

Budgerigar (*Melopsittacus undulatus*). This has much the same distribution and habits as the Cockatiel, and is even more familiar as a cage-bird. The plumage of the wild birds is mainly green, varied with yellow, with the central tail-feathers and a patch on the cheeks, blue. In recent years cage-birds have been produced with various colours unknown in the wild state and a number of colour varieties which breed true have been established. These new colours include sage-green, blue, yellow and white.



(W. S. Berridge.)

KEA (*Nestor notabilis*).
A large New Zealand parrot inhabiting the mountains of the South Island, which is alleged to attack sheep.

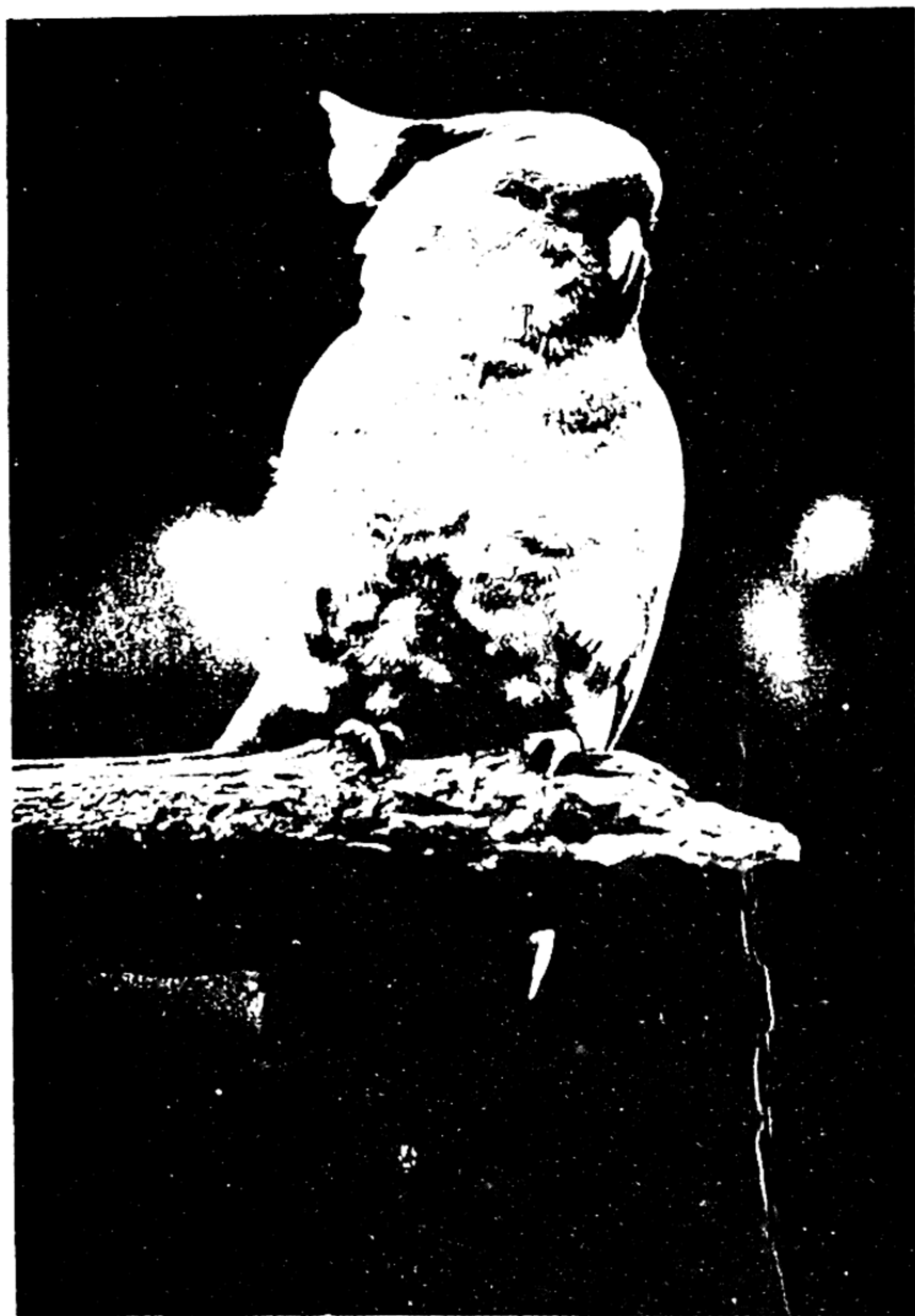
AVES (ORDER PSITTACIFORMES)

Family Loriidae (*Brush-tongued Parrots, Lories, Fig-parrots and Nestors*)

This family contains numerous species found in Australia, New Zealand and New Guinea and the neighbouring islands. These birds have the inner edges of the upper mandible smooth, and the tongue fringed or brush-like at the tip. Most of the species feed largely on honey, which they extract from the flowers with their brush-tongues, as well as on soft fruits.

Kea (*Nestor notabilis*). This bird is an inhabitant of the mountainous districts of the South Island of New Zealand. It is the largest member of the family, measuring twenty-two inches in length. Its plumage is chiefly brownish-green, with a reddish-rump, some blue on the wings,

and the tail green, with a black bar near the tip. The upper mandible of the bill is exceptionally long and much less arched than in most parrots, and its food consists not only of honey and berries, but also of insects extracted from beneath bark, etc., and of carrion. It has earned much notoriety from having acquired the habit of attacking sheep. It is stated that it perches on their backs and digs its long bill into the flesh till it reaches the fat over the kidneys, but accounts are conflicting and it is probable that the amount of injury caused by Keas has been greatly exaggerated.



By courtesy of the]

[Commonwealth of Australia.

PINK COCKATOO (*Cacatua leadbeateri*).

This lovely species with pink plumage and red and yellow crest inhabits the interior districts of Australia, where it is called the Major Mitchell, after the explorer who discovered it.



[Arthur Brook.]

TAWNY OWL (*Strix aluco*).

The mottled plumage of this owl makes it inconspicuous in the daytime.

Order STRIGIFORMES (Owls)

This Order includes a large number of species and is represented in all parts of the world. They are all chiefly nocturnal in their habits, rarely being seen on the wing during the daytime, and they are entirely carnivorous, feeding on small mammals and insects, as well as on bats, birds, reptiles, fish, worms and snails. They have large heads with short, curved, hooked bills; and very large eyes, both turned forward and surrounded by "discs" of feathers supported by "ruffs" of stiff, short, recurved feathers, originating from folds of skin on the cheeks. Owls have little power of moving the eye-ball, hence the whole head is constantly turned to watch passing objects, etc., and the neck can be twisted through 180 degrees. When closed, the eye is covered by the upper eye-lid, instead of the lower as in other birds. The wings are long and rounded, containing eleven primaries, and the tail, usually rather short, contains twelve feathers. The plumage is exceptionally soft and the flight absolutely noiseless. The legs are comparatively short and generally feathered; the toes have sharp, curved claws used for seizing the prey; they are padded beneath and frequently feathered above, and the outer toe can be turned backwards or forwards at will. When perched on a bough an Owl commonly sits with two toes each way, but on the ground with three in front and one behind. Almost all Owls lay oval, pure white eggs. The Order contains two families: *Strigidae* (Brown Owls) and *Tytonidae* (Barn Owls).

AVES (ORDER STRIGIFORMES)

Family *Strigidae* (*Brown Owls*) contains most of the species of Owls. The majority have the plumage brown, mottled with black, grey, yellow and white, and frequently also barred. Many have a tuft of feathers on each side of the head above the ears. The members of this family range in



(D. Seth-Smith.
GREAT HORNED OWL (*Bubo virginianus*).
This most powerful of American owls has been known to strike down geese and turkeys many times its own weight.

size from diminutive insectivorous Owls only five inches long to the great *Hawk Owls*, and *Eagle Owls*, thirty inches long, which prey on hares, fawns, grouse, etc.

Tawny or Wood Owl (*Strix aluco*). This Owl is found in forests and wooded regions throughout Europe, western Asia and north-west Africa. In the British Isles it is the commonest owl, and its long-drawn, quavering hoot may be heard at night even in towns. Its plumage is mottled and streaked with brown, some individuals having grey as the predominating colour, others rufous. Grey and rufous phases exist in many other species of Owls. The Tawny Owl, also called the Brown Owl or Wood Owl, lays three or four eggs in a hollow tree or the deserted nest of some other bird.

Short-eared Owl (*Asio flammeus*). This is a somewhat larger bird than the Tawny Owl and the general tint of its plumage is buffish-brown. Its very

short ear-tufts are only raised when the bird is excited and are not normally visible. It frequents open country such as moors, grassy hillsides, dunes and fens, nesting and settling on the ground and has an enormous geographical range, including North and South America, Europe, North Africa and northern and central Asia. In the British Isles it is uncommon in summer, but many individuals from further north arrive in

SHORT- AND LONG-EARED OWLS



[Stanley Crook.]

BARN OWLS (*Tyto alba*).

The White Owl or Screech-Owl is probably the most widespread species of bird in the world, being absent only from Norway, northern North America and New Zealand.

autumn to spend the winter. On the occasion of plagues of voles numbers have remained to breed in the areas affected as long as the plague lasted.

Long-eared Owl (*Asio otus*). This is a smaller and slimmer bird than either of the preceding and has very long ear-tufts. It frequents woods, especially small plantations of coniferous trees, and usually lays its eggs in the old nests of other birds, sometimes on the ground among heather. Owing to its nocturnal habits and the fact that it is much more silent than



[Walter E. Higham.]

SHORT-EARED OWL (*Asio flammeus*).

This owl, which feeds principally on voles, is almost completely terrestrial.

AVES (ORDER STRIGIFORMES)

most other owls, it is comparatively rarely seen, but occurs in North America, Europe, including the British Isles, and northern Asia.

Little Owl (*Athene noctua*). This was the bird of Minerva and the symbol of Athens. It is an abundant resident in the countries round the Mediterranean and is found north to Holland and the Baltic countries. To the British Isles it was formerly only an occasional visitor, but about 1890 was acclimatized in several parts of England and is now a common resident in England and Wales, north to Lancashire and Yorkshire. It is much smaller than the other owls here described and much less completely



[J. Kershaw.

LONG-EARED OWL (*Asio otus*).

This owl generally rears its young in the old nest of a crow, pigeon, or hawk.

nocturnal, often flying about in the daytime, and frequently perching on stumps or on the ground in the open.

Family Tytonidae (*Barn Owls*) contains only a few species of moderate or large size, but one or more occurs in all parts of the world except New Zealand. The bill is longer and less curved than in the Brown Owls, the facial discs are more or less triangular, the claw of the middle front toe has a serrated margin, and the plumage is buff or greyish above, whitish below.

OIL-BIRD AND FROGMOUTHS

White-, Barn-, or Screech-owl (*Tyto alba*). This Owl occurs almost throughout the world. It is golden-buff above, marked with brown, grey and white; white below, with black spots. When hunting at night, it makes a weird screech; and when perched during the day, a snoring sound. It lays its eggs in hollow trees, towers, belfries, pigeon-cotes, etc.

Order CAPRIMULGIFORMES (Nightjars, Frogmouths, Potoos and Oil-bird)

This is a considerable group of moderate-sized or fairly large birds, represented in all parts of the world except New Zealand and most of the Pacific Islands. They are nocturnal or crepuscular in habits. They have wide bills surrounded by bristles, and soft plumage mottled and pencilled with various shades of brown and rufous, usually with spots or patches of white.

Steatornithidae. This family contains only the Oil-bird or Guacharo (*Steatornis caripensis*), which inhabits northern South America from Trinidad and Guiana to Peru. It has a stout, hooked bill, with stiff bristles at the base, large wings, and small legs and feet, the former covered with smooth, flesh-coloured skin. It spends the daytime in caves on the coast or in the mountains, and at night emerges to seek its food, which consists of oily nuts and fruit, for which it often has to travel long distances. Many birds inhabit the same cave, and when disturbed they make loud croaking or rasping cries. Their nests are flat, circular masses of clay, placed on ledges of their cave, and they lay from two to four white eggs. The young birds are excessively fat and are collected for the table, or for the extraction of the oil they contain.

Podargidae (*Frogmouths*). These are nocturnal birds of owl-like appearance found in tropical Asia, the Malay Archipelago, and Australia. They have very wide, curved, hooked bills, rather short wings, long tails, and short, stout legs; the outer front toe is partially reversible. They build flat, stick nests on the boughs of trees and lay from one to three, usually two, white eggs.

Nyctibiidae (*Potoos*). This family includes a few fair-sized birds inhabiting tropical America, one extending to Mexico and Jamaica. They have very wide bills, without any bristles round the base; their legs are extremely short and the middle toe is flat beneath and without serrations. In other respects they resemble Nightjars.

Aegothelidae (*Owlet-Nightjars*). This family includes a few small nocturnal birds found in Australia, Tasmania, New Caledonia, New Guinea and the Molucca Islands. In their structure they agree closely with Nightjars and Frogmouths, but in appearance they have greater resemblance to small owls. During the daytime they hide in holes in trees, making a hissing noise when alarmed. Their nests are placed in holes in trees or hollow boughs and their two to five eggs are pure white.

AVES (ORDER CAPRIMULGIFORMES)

Family Caprimulgidae (Nightjars or Goatsuckers)

This family includes a large number of species found in all parts of the world but New Zealand and the Pacific Islands. They have flat heads and very large eyes, long wings with ten primaries, tails of ten feathers, short legs and feet with three toes before and one behind, the long, middle front toe having a comb-like structure below. They feed on crepuscular or nocturnal insects which they catch on the wing at dusk or during the night. They make absolutely no nest, but lay two spotted eggs on the ground.

European Nightjar (*Caprimulgus europaeus*). This is a summer visitor to Europe and western Asia, wintering in Africa south to the Cape. In both sexes the plumage is mottled with shades of brown and grey, but the male has white spots on the wings and tail-feathers, which are conspicuous

in flight in the day-time. The eggs are creamy - white marbled with grey and black. When perching on trees, the Nightjar almost always sits lengthwise on a branch instead of across it. The loud, vibrating "churr" or reeling call is uttered by the male when perched.



TAWNY FROGMOUTH (*Podargus strigoides*).
Showing the attitude of the bird when alarmed. In this position it looks exactly like a broken branch.



Photos] TAWNY FROGMOUTH (*Podargus strigoides*). [Otho Webb.
The bird in its normal attitude on its flimsy nest of sticks in the Australian bush.

Order MICROPODIFORMES (Humming-birds and Swifts)

A very large group of small or very small birds of which representatives occur throughout the world except in New Zealand and some of the Pacific Islands. They are, perhaps, the most aerial of all birds, having exceptionally elongated wings, and being capable of extremely rapid flight. Their legs and feet are very small and are adapted only for perching, the birds being incapable of running or hopping on the ground. They lay from one to four white eggs.

Family Micropodidae (Swifts)

This family includes a large number of species and is represented in almost all parts of the world except New Zealand. Swifts have short, flat, triangular bills, very wide at the gape; very long wings with ten primaries, of which the first is the longest; tails of ten feathers, which are often rigid and pointed; short legs, often feathered; and feet in which either all the toes are pointed forward (True Swifts), or three forward and one inwards. The plumage is hard and mainly dark brown or blue-black, usually with some white patches.

Swifts are insectivorous and obtain all their food on the wing. They are apparently incapable of perching on trees, but when they settle, which they rarely do in the daytime, they cling to the face of a cliff or the bark



(L. J. Langford.)

NIGHTJAR (*Caprimulgus europaeus*).
The Fern-Owl or Goatsucker, owing to the protective coloration of its plumage, is extremely difficult to discover in the daytime.

AVES (ORDER MICROPODIFORMES)

of a tree-trunk, roosting at night inside chimneys, hollow trees or caves. In most species, the nest is largely composed of a glutinous substance secreted by the salivary glands, in which are embedded twigs, leaves, etc.

Edible-nest Swift (*Collocalia esculenta*). This makes a nest entirely or almost entirely of this glutinous substance, and its nests are valued by Chinese and Japanese epicures. They are attached in colonies to the walls and

roofs of dark caves in some of the islands of the Indian Ocean, and these caves form valuable properties in which all the accessible nests are annually collected for sale.

Common Swift (*Micropus apus*). This is a summer visitor to Europe and northern Asia, wintering in Africa as far south as the Cape. Its plumage is entirely dusky except for the whitish chin and throat. Its note is a loud, harsh scream, constantly uttered as it circles round buildings or cliffs at great speed, usually in flocks. Its nest is placed in a hole or crevice in a cliff, a building, or a hollow tree; there are two to four white eggs.

Macropterygidae (*Crested Swifts*). This family contains about half a dozen species found in tropical Asia and the Malay Archipelago east to the Solomon Islands. They have short, flat, broad bills; very long wings; long, forked tails; very short legs; and feet with three toes in front and one behind. Their plumage is soft and they have a patch of downy or silky



[Oliver G. Pike.

SWIFT (*Micropus apus*).

This bird usually spends the whole day on the wing, but is here seen in the attitude which it adopts when roosting.

feathers on the flanks and a crest on the head. They feed entirely on insects captured on the wing, spending much time in the air, but also perching in trees. Their very small saucer-shaped nests are composed of bits of bark, etc., cemented together by saliva, and glued to the upper side of a branch. The nest is just large enough to contain the single egg, and is quite concealed by the sitting bird.

HUMMING-BIRDS (TROCHILIDAE)

Family Trochilidae (*Humming-birds*)

The family Trochilidae contains a very large number of small or minute birds that are found in America, chiefly in Central and tropical South America. They have long slender bills, longer in proportion to their size than in any other birds, and very long tongues in the form of a double tube, capable of protrusion beyond the tip of the bill. Their long wings contain ten primaries of which the first is almost always the longest. Their tails are of ten feathers. Their small feet have three toes in front and one behind. Almost all the species have brilliant metallic colours in their plumage, the apparent hue of which depends on the angle from which it is viewed, and as they move swiftly about they flash like jewels. The males are commonly much more brilliant than the females and the various species possess crests, ear-tufts, neck-frills, and many other types of ornament.

The food of Humming-birds consists of minute insects, supplemented by nectar, and most of the species obtain it by hovering in front of flowers like Hawk-moths, thrusting their bills into the blossoms, and sucking up insects and nectar through their tubular tongues. Their wings vibrate so rapidly that they appear as a faint, blurred outline on each side of the

small body. Often the bird remains for a few seconds before a blossom, then darts away at a speed which renders it almost invisible, and reappears in front of another flower. The vibration of the wings is in many species accompanied by a loud humming sound from which the name Humming-bird is derived. Some species feed principally on insects found in the crevices of bark or on leaves, hovering before the tree-trunks or amongst the foliage.

The males are very pugnacious, darting furiously at one another, and circling round uttering shrill notes. They also attack much larger birds, if these come near their nests, which are rather deep, cup-shaped structures of plant down, moss, or other soft materials, felted into a very light and spongy mass, sometimes no larger than a walnut-shell, attached to twigs or leaves, often in a fork.



[W. S. Berridge.
PREVOST'S HUMMING-BIRD (*Lampornis prevosti*).
A Venezuelan representative of the family, which contains the
smallest of all birds, and is confined to America.

Order COLIIFORMES (Colies or Mouse-birds)

This Order contains only the family *Coliidae* (Colies or Mouse-birds), consisting of about nine species found in Africa. They are small birds with short, dense feathering and stout, finch-like bills. Their wings are weak and rounded and contain ten primaries and their very long tails contain ten feathers, of which the outer pair are short. They have long legs, and feet in which all four toes are normally turned forward, though the outer two are capable of being bent back. They are dull brown or grey in colour, with buff underparts and a crest on the head.

Mouse-birds are usually found in small parties in wooded country, creeping about the trees with the lower leg applied to the branch. The birds feed almost entirely on fruit. Their cup-shaped nests of twigs, roots and grass are built near the ground in bushes or low trees, and they lay three or four dull white eggs, sometimes streaked with orange or brown.

Order TROGONIFORMES

This Order contains only the family *Trogonidae* (Trogons), comprising about fifty species found in the tropical forests of America, Africa and Asia. They are moderate-sized birds of somewhat heavy aspect, with short necks. They have short, strong, wide bills, hooked at the tip and surrounded by bristles; their rather short wings contain ten primaries and their long tails contain twelve feathers. Their legs are short and feathered and the short, weak feet have two toes turned forward and two back; in Trogons, however, it is the first and second toes that are behind, instead of the first and fourth as in all other birds which have two toes turned backwards. The plumage is in most species remarkable for its brilliance; the large, soft feathers are very loosely attached to the thin skin and readily fall out.

Trogon inhabits dense, shady forests, creeping about the trees or sitting quietly on a bough, occasionally darting out into the open to seize an insect or a berry, almost all their food, including fruits, being obtained on the wing. They lay from two to four white, bluish-green or buff eggs in a cavity excavated by them in a rotten stump or bough or an ants' nest.

Quezal (*Pharomacrus mocinno*). This most beautiful and remarkable species is found in the mountains of Central America. The male has the upper parts brilliant golden-green, the wing quills black, the tail black and white, the throat green and the underparts vivid scarlet. It has a rounded crest of hair-like feathers; long, pointed scapulars hanging over the wings and long, flowing plumes springing from the rump hanging over the tail. Though the bird is only the size of a dove, these last feathers measure from three feet to three feet six inches in length.

Order CORACIIFORMES (Kingfishers, Todies, Motmots, Bee-eaters, Rollers, Hoopoes and Hornbills)

This is a comparatively small group of birds, chiefly found in the tropics, exhibiting much diversity of form but agreeing in certain features of their internal anatomy. Their feet normally have three toes in front and one behind, though occasionally one toe is absent and some can voluntarily turn one of the front toes backwards. In many cases, also, the front toes are more or less united at the base. They are nearly all birds with brilliant plumage and lay white eggs in holes.

Family Alcedinidae
(Kingfishers)

This family includes a large number of small or moderate-sized birds distributed in almost all parts of the world, but chiefly found in the tropics and especially abundant in New Guinea and the eastern part of the Malay Archipelago. They have long, stout straight bills and large heads, frequently crested; their wings are short and rounded, with eleven primaries of which the

first is small; their tails are usually short, and their legs and feet small and weak. Their plumage is usually brilliant, but the species vary greatly in colour. They lay round, glossy, thin-shelled, white eggs in holes or burrows.

European Kingfisher (*Alcedo atthis*). This is the only representative of the family in western Europe, and is found also in North Africa and



By courtesy of]

[The Commonwealth of Australia.

LAUGHING JACKASS (*Dacelo gigas*).

The largest member of the Kingfisher family, a native of Australia, where it is called Kookaburra, and generally protected owing to its fondness for snakes.

AVES (ORDER CORACIIFORMES)

throughout Asia. Its plumage is dazzling cobalt-blue or emerald-green above, the apparent colour depending on the angle from which it is viewed, below it is orange and its feet are red. It feeds almost exclusively on small fish, for which it plunges into the water from an overhanging bough. Its nest is a bed of fishbones at the end of a burrow in a river bank.

Laughing Jackass or Kookaburra (*Dacelo gigas*). This Australian bird is the largest member of the family, about eighteen inches 'long, with a



KINGFISHER (*Alcedo atthis*).

(A. M. Willford.

This bird is carrying a stickleback to feed his sitting mate, holding it head foremost so that she can swallow it head first.

powerful, slightly-hooked bill. Its plumage is chiefly various shades of brown, with a patch of blue in the wings, and the male has also blue on the rump. It is found in open forest country and feeds on large insects, rats and mice, lizards, snakes, small birds and eggs. Its eggs are laid in a hole in a tree or a burrow excavated in the nest of a white ant. It has a very remarkable, loud, laughing call, which is uttered very frequently, especially at daybreak and at dusk. When one bird starts, others join in, filling the air with their boisterous mirth.

Family **Todidae** (*Todies*) contains only four kinds of diminutive

West Indian birds, one each in Cuba, Haiti, Porto Rico and Jamaica. They have rather long, straight, flattened, reddish bills, short wings, short, square tails and long legs, and their plumage is green above, bright red on the throat, and yellowish or pinkish-white below. They frequent wooded ravines, and feed on insects which they capture on the wing. Their three or four round white eggs are laid in a lengthy burrow, usually in sand.

Family **Momotidae** (*Motmots*) includes a small number of species mostly

MOTMOTS, BEE-EATERS, ROLLERS

found in Central America, a few forms extending to southern Mexico, the West Indies and tropical South America. They have rather stout, somewhat curved bills with serrated edges and a few bristles at the base ; rather short, rounded wings with ten primaries ; long, graduated tails and short legs. The sexes are similar and have green, blue, cinnamon and black plumage. In most of the species the central pair of tail feathers are elongated and have spatulate or racquet tips, the shafts being bare for a considerable distance but with barbs for a short distance at the tip. This effect is produced by the bird itself nibbling away the barbs for a space below the tips.

Motmots frequent shady forests and spend much of their time perched in the trees, darting out at intervals to secure flying insects. They also eat fruits and small reptiles. They lay three or four round, creamy-white eggs in holes in trees or banks.

Family *Meropidae* (*Bee-eaters*) includes a number of birds of moderate or small size chiefly found in Africa and in tropical Asia ; one visits Australia in the southern summer, and one visits southern Europe and temperate western Asia in the summer, not infrequently wandering north to the British Isles and other parts of northern Europe. The bill is long and slightly curved, the wing contains eleven primaries of which the first is very short, the tail consists of twelve feathers, the legs and toes are very short. The plumage in both sexes is brilliant, commonly exhibiting shades of blue, green or copper colour.

Bee-eaters are graceful, lively birds which hawk, generally in flocks like Swallows, for flying insects. They are sometimes very destructive to bees if they establish themselves in the neighbourhood of hives, though these are by no means, as their name suggests, their only or principal food. They excavate long burrows in banks, or sometimes in level ground, and lay from four to six round, glossy white eggs. They commonly breed in colonies.

Family *Coraciidae* (*Rollers*) contains about twenty species of moderate-sized arboreal birds found in Africa and tropical Asia, one species visiting Europe and northern Asia in summer and one visiting Australia in the southern summer. They have strong, rather wide, curved hooked bills ; long, rounded wings with ten primaries ; tails of twelve feathers and short legs. Their plumage is generally either blue of various shades or green, often varied with reddish. They are active, noisy birds, frequently uttering harsh, chattering notes, and capture their insect food on the wing or on the ground, also feeding on worms, frogs and small reptiles. They lay four or five glossy white eggs in a hole in a tree or bank. Their name is derived from their remarkable habit of tumbling and rolling over in the air during flight.

Family *Leptosomatidae* (*Ground-rollers*) contains only six species found in Madagascar, one of them also in the Comoro Islands. They have rather

AVES (ORDER CORACIIFORMES)

stout, slightly hooked bills and fairly long tails of twelve feathers. They frequent the forests, but most of them are mainly terrestrial, seeking at dusk large insects, lizards, etc. Their eggs are white.

Family Upupidae (*True Hoopoes*) contains the Common Hoopoe (*Upupa epops*) whose names are all derived from its soft, reiterated call-note "hoop, hoo." It is found in Europe, Asia and Africa, but is only a summer visitor to Europe and temperate Asia. In England a few occur regularly in spring and some also in autumn, and they have not infrequently bred in the southern counties, but their striking appearance commonly leads to their being shot.

The Hoopoe has a long, slender, slightly curved bill, broad wings with ten primaries; a square tail of ten feathers; short legs and rather long toes. The head, shoulders and underparts are cinnamon-coloured, the head bearing a crest of long feathers tipped with black, which is fan-shaped when fully spread; the lower back and the wings are barred with black, white and buff, and the tail is black with a broad white band. The food is mostly obtained on the ground, consisting of worms and insects, and the nest is placed in holes and is evil-smelling from the use of excrement for the lining. From four to seven dull greenish-blue eggs are laid.

Family Phoeniculidae (*Wood-hoopoes*) includes ten species found in Africa. They have long, curved bills; broad wings with ten primaries; and long, wedge-shaped tails. Their plumage is metallic purple, blue or greenish, with a white patch in the wings and some white in the tail. They are mainly arboreal and feed on insects, for which they probe the crevices of the bark or search on



[Arthur Brook.]

HOOPOE (*Upupa epops*).
This striking bird frequently visits and occasionally nests in the British Isles.

HORNBILLS (BUCEROTIDAE)



RHINOCEROS HORNBILL (*Buceros rhinoceros*).

The male is seen outside the nest and the bill of the immured female is protruding from the narrow opening.

[Keystone.

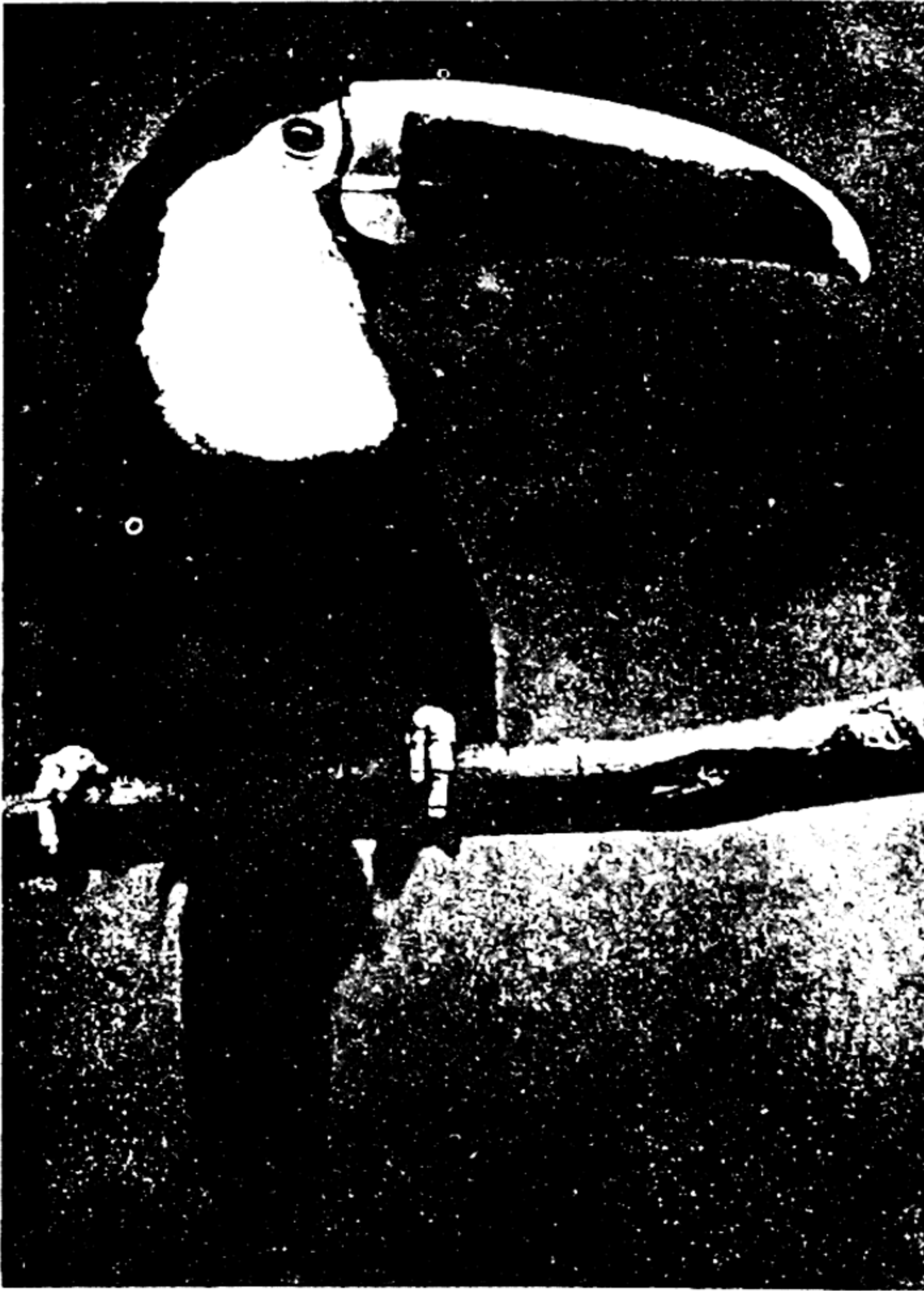
the ground. They make loud, harsh, chattering notes and breed in holes in trees, laying white eggs.

Family Bucerotidae (*Hornbills*) comprises about sixty species of moderate-sized or large birds found in Africa, tropical Asia and the Malay Archipelago east to the Solomon Islands. They have extremely large bills, unique in having a casque or helmet, which varies much in shape and size according to the species, developed on the upper mandible; their powerful wings have eleven primaries; their tails are long and contain ten feathers; whilst the legs are rough and scaly and the toes have flat soles. They have prominent eyelashes, a rare feature among birds.

Hornbills feed on fruits, berries, insects and reptiles; most of the species are mainly arboreal, but two species are largely terrestrial (Ground Hornbills); some forms when flying make a noise resembling the puffing of a steam engine when starting a train, which can be heard a mile away. They breed in holes in trees, the hen bird being immured in the hole throughout the period of incubation by her mate, who builds a wall of mud across the entrance, leaving only a slit through which he feeds her. The eggs are white when laid.

**Order PICIFORMES (Jacamars, Puff-birds, Barbets, Honey-guides,
Toucans, Woodpeckers, Piculets, Wrynecks)**

A considerable group of birds, almost all of which are arboreal. They differ greatly in external appearance, but agree in certain features of their internal anatomy and in the structure of their feet, which have two toes directed forwards, and two backwards. They all lay white eggs.



[D. Seth-Smith.

CUVIER'S TOUCAN (*Rhamphastos cuvieri*).

The large bills of these tropical American birds are extremely light, and enable them to gather fruits which would otherwise be out of reach.

Family Galbulidae
(*Jacamars*) includes a number of rather small birds found in tropical America. They have long, straight, compressed, pointed bills; rounded wings with ten primaries, of which the first is very small; tails of twelve feathers, of which the outer pair are very small or sometimes absent; and slender, weak legs and feet. Their plumage is generally brilliant, metallic, coppery or golden-green or blue above, sometimes chestnut or blackish, commonly also more or less rufous below. They frequent lofty forest trees, often on the edge of a clearing, and fly out from their perch to catch insects on the wing. They breed in holes and lay white eggs.

Family Bucconidae
(*Puff-birds*) contains a

number of small or moderate-sized birds found in tropical America. They have broad, stout beaks, with somewhat hooked tips; rounded wings with ten primaries; tails of twelve feathers and fairly strong legs. Their plumage is black, brown or rufous, varied with white markings, and their bills are often red or yellow. They commonly sit quietly on the boughs of trees with the feathers of the head more or less puffed out (hence their name), occasionally

BARBETS, HONEY-GUIDES, TOUCANS

flying out to capture some passing insect. They lay white eggs in holes.

Family *Capitonidae* (*Barbets*) includes a considerable number of heavy, ungainly birds inhabiting the forests of tropical America, Africa and Asia. They have large, stout bills, swollen at the base and beset with bristles; moderate wings with ten primaries; and strong feet with long claws. Their plumage commonly exhibits vivid contrasts of scarlet, blue, purple or yellow on a green ground, but some are plainly coloured. They are arboreal birds, and generally sit on the boughs of the trees for long periods without moving, at intervals uttering loud, ringing metallic notes or whistles. They feed largely on fruits, berries, buds, flowers and leaves, also on insects. They excavate holes in soft or decaying wood and lay from two to five white eggs.

The Coppersmith (*Xantholaema haematocephala*) obtains its name from its remarkably loud, metallic note, which sounds like "took-took-took." It is uttered while the bird is perched in a tree, and at each call it nods its head, first to one side, then to the other. It is common throughout India and its range extends to Ceylon, Burma, the Malay Peninsula, Sumatra and the Philippines. It is green above, and whitish below, striped with green, with the forehead and a band on the breast crimson, and patches of black, yellow and blue on the head.

Family *Indicatoridae* (*Honey-guides*) includes about ten species of small birds mostly found in Africa south of the Sahara, but with one representative in the Himalayas and one in the mountains of Malaya and Borneo. They have short, stout, pointed bills and short legs, and their plumage is mainly dull brown in colour, often tinged with yellow or marked with white or black. They lay two white eggs in the deserted nests of other birds.

Their name is derived from their remarkable habit of attracting the attention of a man by fluttering and calling in the bushes near him and then leading him to a tree in which there is a bees' nest. If he cuts out the comb to extract the honey, they feed on the grubs disclosed. They are said also to lead the ratel to bees' nests, and sometimes to lead a man to a leopard, cat, dog or snake.

Family *Rhamphastidae* (*Toucans*) includes numerous species found in the forests of tropical South and Central America recognizable at once by their enormous bills. Though both mandibles are greatly enlarged, the external walls are extremely thin and internally they are largely hollow, with a network of bony columns to give rigidity. These great bills and a ring of bare skin round the eye are often brightly coloured, sometimes in harmony with and sometimes contrasting with the bright colours of the plumage. Toucans have somewhat weak wings with ten primaries; fairly long tails of ten feathers, often carried bent forward over the back; stout legs; toes with papillae below and sharp, curved claws. They live almost entirely in the tree-tops. They feed principally on fruits and seeds, but also on insects and perhaps also on birds' eggs, small birds, reptiles,

AVES (ORDER PICIFORMES)



[T. M. Fowler.]
LESSER SPOTTED WOODPECKER (*Dryobates minor*).
 This little bird, also called the Barred Woodpecker, feeds chiefly on the higher boughs of large trees.

etc. Small fruits, etc., picked with the tips of the long bill are thrown back to the throat and swallowed with a sudden upward jerk of the head. They lay two white eggs in hollow limbs of tall trees.

Family Picidae (Woodpeckers, Piculets and Wrynecks)

This family includes a large number of species. They are to be found in all parts of the world except the island of Madagascar, the eastern portion of the Malay Archipelago, New Guinea, Australia, New Zealand and the Pacific Islands. The majority of the species climb about the trunks and large boughs of trees and have short legs with strong feet and claws,

and tails of twelve feathers, generally with stiff, spiny shafts, which help to support the bird. They have large heads, very muscular necks and strong, wedge-shaped bills; they obtain their food, which consists mainly of wood-boring insects, by chiselling out their burrows in the wood, using their bills as picks. They have exceptionally long tongues, which can be protruded far beyond the bill, and are often barbed at the tip, and are kept moist with a sticky secretion from large salivary glands. With their tongues they drag insects from crevices or tunnels. With their powerful bills they also excavate cylindrical holes in trees for breeding, laying their white eggs on a few chips of wood at the bottom of the cavity.

Green Woodpecker (*Picus viridis*). This bird has the upper plumage mainly green, shading into yellow on the rump, paler on the underparts;

WOODPECKERS (PICIDAE)

the crown and nape are crimson and a moustache-like band on the cheek is crimson in the male, black in the female. It has a loud, laughing call, and supplements the food it obtains from the trees by procuring ants on the ground. It occurs in wooded districts throughout most of Europe, Asia Minor and Persia, but in Britain is scarce and local north of Yorkshire and to Ireland is a very rare straggler.

Flicker or Golden-winged Woodpecker (*Colaptes auratus*). The Flicker occurs in summer throughout the United States and Canada north to the limit of trees, but the Canadian birds migrate south for the winter.

It is more addicted to ants than the Green Woodpecker, and spends much of its time on the ground in search of them. Its crown is grey, the nape bright scarlet, the back brownish-grey barred with black, the rump white, the wings and tail black and yellow, the underparts vinaceous and white with a broad crescent across the breast and black spots on the belly. The male has black moustache stripes, which are absent in the female.

Great Spotted Woodpecker (*Dryobates major*). This Woodpecker is mainly black above with patches and bars of white, white below with a crimson patch on the vent. The male also has the nape crimson. It is found in wooded parts of Europe, north Africa and northern Asia from Britain to Japan, but is only an occasional visitor to Ireland.

Lesser Spotted or Barred Woodpecker (*Dryobates minor*). Like its larger relative this bird ranges across Europe and Asia from Britain to Japan, but in



[Arthur Brook.
GREEN WOODPECKER (*Picus viridis*).
The largest of the British Woodpeckers, whose loud, laughing call has earned it the name of Yaffle.

AVES (ORDER PASSERIFORMES)

Britain is confined to England and Wales. The upper parts are barred with black and white and the underparts buffy-white. Young birds and the adult male have the crown red, but in the female it is whitish.

Wryneck or Cuckoo's-mate (*Lynx torquilla*). This bird differs from the typical Woodpeckers in its softer plumage and its tail, which is only slightly rounded and composed of ordinary feathers without stiffened, pointed shafts. Its plumage is delicately pencilled and mottled with grey, brown, buff and black, and the sexes are similar. It is found in summer throughout most of Europe, north Africa and northern Asia, but in the British Isles only in England. In winter it is found in tropical Africa and India, but a few remain in countries round the Mediterranean. It feeds largely on ants obtained on the ground as well as on insects found in crevices of the bark of trees, but its weak bill is not used for excavating holes in wood, and it nests in natural hollows.

Order PASSERIFORMES (Perching-birds)

Between five thousand and six thousand birds, or about half the known species, are included in this Order. Its members are found in all lands, except Antarctica, but none of them is marine. Amongst them are included such familiar forms as the Crows, Finches, Larks, Tits, Warblers, Thrushes, Flycatchers and Swallows. They are mostly comparatively small, the largest being the Ravens and Lyre-birds.

Apart from certain features of the skeleton and muscular system, the chief external character distinctive of the Order is the form of the foot. This has three toes turned forward, and one behind, which is always inserted at the same level as the others. The toes can be bent downwards to obtain a firm grasp of a twig, or even of a wire, but none of them can be bent sideways. The hind toe is usually at least as long as the longest (middle) front toe.

Perching-birds construct more or less elaborate nests, and their young, when hatched, are naked and helpless, being completely dependent on their parents for days, or even weeks. Though it is impossible to frame any satisfactory definition to distinguish song from the other vocal utterances of birds, all the species pre-eminent as song-birds are members of this Order, including as it does the Nightingales, Thrushes, Warblers, Mocking-birds, Bulbuls, Finches and Lyre-birds. The form of the vocal organ (syrinx) and the number and arrangement of the muscles attached to it present four distinct types among the perching-birds, and thus permit of their division into four suborders. These are of very unequal extent, two of them containing only a few species each, whereas the other two each contain very large numbers. The so-called families into which these suborders are commonly divided are mostly groups of genera which appear to be more or less closely allied, but cannot be strictly defined, as so many forms are more or less intermediate. The form of the bill, nostrils, tongue,

PERCHING BIRDS

legs and feet, and the numbers of primaries and tail-feathers are the characters chiefly considered when dividing the suborders into families, but various authorities differ greatly in their views on the question. The classification here adopted is :—

Suborder Eurylaemi

Family *Eurylacmidae*
(Broad-bills).

Suborder Tyranni

Families *Dendrocolap-
tidae* (Wood-hewers), *Fur-
nariidae* (Oven-birds),
Formicariidae (Ant-
thrushes), *Conopophagidae*
(Ant-pipits), *Rhinocrypti-
dae* (Tapacolas), *Cotingidae*
(Chatterers), *Pipridae*
(Manakins), *Tyrannidae*
(Tyrant Flycatchers),
Oxyruncidae (Sharp-bill),
Phytotomidae (Plant-
cutters), *Pittidae* (Pittas),
Xenicidae (New Zealand
Wrens) and *Philepittidae*
(Wattled Ant-thrushes).

Suborder Menurae

Families *Menuridae*
(Lyre-birds) and *Atrichor-
nithidae* (Scrub-birds).

Suborder Oscines

Families *Hirundinidae*
(Swallows), *Campophagi-
dae* (Cuckoo-shrikes),

Pycnonotidae (Bulbuls), *Timeliidae* (Babblers), *Prunellidae* (Accentors),
Troglodytidae (Wrens), *Cinclidae* (Dippers), *Paramythiidae*, *Zeledoniidae*
(Wren-thrush), *Turnagridae* (New Zealand Thrushes), *Mimidae* (Mocking-
birds), *Turdidae* (Thrushes), *Sylviidae* (Warblers), *Muscicapidae* (Fly-
catchers), *Virconidae* (Greeniets), *Bombycillidae* (Waxwings), *Ptilogonatidae*
(Silky Flycatchers), *Dulidae* (Palm-chats), *Artamidae* (Wood-swallows),
Vangidae (Madagascar-shrikes), *Grallinidae* (Magpie-larks), *Prionopidae*



[Arthur Brook.

GREAT SPOTTED WOODPECKER (*Dryobates major*).
This is the only kind of Woodpecker which nests in Scotland, whilst in
Ireland the family is not represented.

AVES (ORDER PASSERIFORMES)

(Wood-shrikes), *Aerocharidae* (Helmet-bird), *Cyclarhidae* (Pepper-shrikes), *Vireolaniidae* (Shrike-vireos), *Streperidae* (Crow-shrikes), *Laniidae* (Shrikes), *Regulidae* (Kinglets), *Chamaeidae* (Wren-tit), *Paridae* (Tits), *Hyposittidae* (Coral-billed Nuthatch), *Sittidae* (Nuthatches), *Certhiidae* (Creepers), *Zosteropidae* (White-eyes), *Dicaeidae* (Flower-peckers), *Promeropidae* (Long-tailed Sun-bird), *Nectariniidae* (Sun-birds), *Meliophagidae* (Honey-eaters), *Mniotiltidae* (Wood Warblers), *Drepanididae* (Hawaiian Honey-suckers), *Enicuridae* (Fork-tails), *Motacillidae* (Wagtails), *Alaudidae* (Larks), *Fringillidae* (Finches), *Catamblyrhynchidae* (Plush-capped Finch), *Coccyzidae* (Quit-quits), *Procnitidae*, *Thraupidae* (Tanagers), *Ploceidae* (Weaver-birds), *Icteridae* (Troupials), *Oriolidae* (Orioles), *Buphagidae* (Ox-peckers or Rhinoceros Birds), *Graculidae* (Glossy Starlings), *Sturnidae* (Starlings), *Dicruridae* (Drongos), *Ptilonorhynchidae* (Bower-birds), *Paradisidae* (Birds of Paradise), *Creadiontidae* (Saddlebacks), *Callaeadidae* (Wattled Crows), and *Corvidae* (Crows).

Eurylaemidae (*Broad-bills*). This family includes a small number of birds found in tropical Asia, chiefly in the Malayan region, but with one or two representatives in tropical Africa. The beak is very broad, sometimes also short and sometimes hooked at the tip; the outer and middle toes are more or less united at the base and the small hind-toe is incapable of independent movement. Nearly all have beautiful plumage, the most remarkable being rich green. The Broad-bills inhabit forests, thickets and gardens, flying little but sitting on the branches and snapping up flying insects, some also feeding on berries and fruit.

Dendrocolaptidae (*Wood-hewers*). The numerous species in this family are found in Central and South America, chiefly in the tropical forests. They have long, slender, straight or curved bills; fairly long, graduated tails whose feathers have stiffened points; and feet in which the three front toes are partially united at the base, the outer toe being as long as the middle one. In plumage, which is always some shade of brown, and in the form of the bill and tail, the Wood-hewers resemble Creepers, but in their habits they more closely resemble Woodpeckers, tapping and hammering on tree-trunks and chipping away decayed wood in search of boring insects.

Furnariidae (*Oven-birds*). This family includes a very large number of species found in South and Central America, specially abundant in southern Brazil, Uruguay and Argentina. They vary greatly in size, form and colour, though they never have brilliant colours. Many are terrestrial but some resemble Creepers or Tits in their habits.

The Red Oven-bird or Hornero (*Furnarius rufus*) has the upper parts rufous-brown, brightest on the tail, and the underparts nearly white. It is a common and favourite bird in Paraguay, Uruguay and Argentina, inhabiting open country, gardens and the vicinity of houses, where it runs actively about on the ground. It builds a very large and remarkable nest of mud on a bare bough, post or roof of a building. Externally the

OVEN-BIRDS, TAPACOLAS, CHATTERERS

structure is globular, a foot or more in diameter, and very massive, sometimes weighing eight or nine pounds ; a central partition divides it into a vestibule and an inner nest-chamber which communicate by a comparatively small hole at the end of the vestibule remote from the external entrance. In the inner chamber a nest of soft grass is built and four or five white eggs are laid.

Formicariidae (*Ant-thrushes*). In this family are a very large number of species found in South America and Central America north to Costa Rica, most numerous in the Amazonian and Guiana forests. In size they range from that of a Wren to that of a Jay, and their form also varies greatly. They are nearly all birds of plain plumage, none having any brilliant colours, and most of the species are chiefly terrestrial. They feed largely on ants and other insects. Some of them are fine songsters.

Conopophagidae (*Ant-pipits*). This family includes a few small birds found in tropical South America. They have large heads ; short, rounded wings ; and short tails. They are mainly brown in colour.

Rhinocryptidae (*Tapacolas*). The Tapacolas include a number of small terrestrial wren-like birds found in South America, chiefly on or near the Andes, one occurring as far north as the mountains of Costa Rica. They are drab in colour and have rather short, stout bills ; short, rounded wings with ten primaries ; short tails usually carried erect or bent forward over the back ; and large, strong feet. They hop or run actively on the ground, but their powers of flight are very limited. Their notes are varied and remarkable but harsh and loud.

Cotingidae (*Chatterers*). This family includes a very large number of small or moderate-sized birds found in tropical America, with two representatives in Jamaica. They differ greatly in size, form and coloration. Most species are said to feed largely on fruits.

Umbrella-bird (*Cephalopterus ornatus*). This bird of northern South America obtains its name from its huge crest of bare-shafted feathers with loosely-webbed tips ; this crest is attached to a contractile skin, and when erected and expanded forms a dome-shaped or umbrella-like ornament. The male has also an elongated, pendent, feathered wattle hanging from the fore-neck. Both sexes are entirely black, and are nearly as large as Crows.

Common Bell-bird (*Procnias nivea*). This is an entirely white bird the size of a Jay, and is found in Guiana. The male has a spiral tube on the forehead ; this tube is jet-black dotted all over with small white feathers ; ordinarily it is pendent, but when the bird is excited, it can be inflated with air and then forms an erect spire about three inches long. The bird derives its name from its deep, bell-like note which is uttered at intervals of several minutes.

Cock of the Rock (*Rupicola crocea*). The Cock of the Rock inhabits Guiana and Brazil, and is remarkable for its flattened, disc-like crest and

AVES (ORDER PASSERIFORMES)

plumage of a bright orange colour. It has brown and white wings, and a partly-blackish tail.

Pipridae (*Manakins*). This family includes a large number of small birds found in tropical America. They have rather short, broad bills; wings with ten primaries, of which the first is short; very short tails, except in some species where the central pair of feathers is elongated; and moderately long legs. In most species the sexes differ in colour, the males being largely black with patches of bright blue, crimson, orange, yellow or white, whilst the females are greenish.

Tyrannidae (*Tyrant Flycatchers*). The Tyrannidae include a very large number of small or moderate-sized birds distributed throughout North and South America, specially numerous in the tropics. They have somewhat hooked bills and wings with ten primaries. Many of them closely resemble the Flycatchers of the Old World, but there is great diversity of size, form and colouring among them. The majority feed almost exclusively on insects, but some of the larger forms also kill small mammals, reptiles, frogs, etc.

King-bird (*Tyrannus tyrannus*). This bird is eight and a half inches long, slaty-grey above, becoming black on the head and tail, which is tipped with white; the underparts are white; concealed orange-red feathers on the crown form a crest when elevated. In summer it is found throughout temperate North America, wintering in the tropics. The nest is cup-shaped and is generally built near the end of a bough; the three to five eggs are white, spotted with brown.

Oxyruncidae. This family contains only the Sharp-bill (*Oxyruncus cristatus*), which ranges from south-eastern Brazil to Costa Rica. It is a small bird with a straight, wedge-shaped, sharp-pointed bill; a rather short tail and strong legs. The sexes are alike in colour; olive-green above, yellowish-white below with bars and triangular spots of black. The top of the head is spotted with black, and there is a band of elongated, orange-red feathers which form a crest when elevated.

Phytotomidae (*Plant-cutters*). The Plant-cutters include only a few small birds found in South America. They have stout, finch-like bills with serrated edges; short wings with ten primaries; and twelve tail-feathers. The males are brownish-grey above, with blackish wings and tail and reddish breasts; the females are greyish above and buffy below with dark streaks. They inhabit arid regions covered with bushes, and feed on buds, leaves, berries and seeds. The nest is slight and shallow, placed in a bush, and the eggs are bluish-green with brown flecks.

Pittidae (*Pittas or Ant-thrushes*). The Pittas include about fifty species, mostly inhabiting the jungles of tropical Asia and the Malay Archipelago; a few occur in China, two reach Australia, whilst one is found in West Africa. They are small or moderate-sized birds with stout, strong bills; short, rounded wings; very short tails and long legs. They are almost

ANT-THRUSHES AND NEW ZEALAND WRENS

entirely terrestrial in habits. Few birds have such brightly-contrasted coloration—deep velvety black, pure white and intensely vivid scarlet, turquoise-blue and beryl-green are found in a great many—and these colours are almost always distributed in large patches standing out distinctly without any blending. The rounded nest of grass, moss and roots, with entrance at the side, is built on or close to the ground, and the eggs are usually creamy-white with brown, reddish, grey or purplish-black spots or scrawls.

Xenicidae (*New Zealand Wrens*). There are only four species and these are confined to the wooded mountain regions of New Zealand. They are very small birds with rather long, slender bills ; short wings ; extremely short tails ; rather long legs and proportionately very large feet. In all of them the upper plumage is mainly green in the males and brownish in the females. They are insectivorous and obtain their food by climbing up the trunks of trees or over rocks, never flying very far. Their nests are domed and they lay white eggs.

Philepittidae (*Wattled Ant-thrushes*).

This family contains only two species, found in Madagascar. They

are small birds with slender, curved bills ; short, rounded wings ; short tails and stout feet. The sexes are differently coloured, and the males have an area of naked skin round each eye, surmounted by a green caruncle, or wattle.

Menuridae (*Lyre-birds*). This family contains only two species, both found in south-eastern Australia. They are comparatively large birds, with short, rounded wings containing eleven primaries ; long tails of sixteen feathers ; long legs ; and very strong, large feet. They frequent gorges and damp hill-sides in forest country, scratching up fallen leaves and debris with their long feet to secure the insects, centipedes, crustaceans and snails on which they feed. The nest is a large domed structure, built on a log, in the top of a tree-fern or on a ledge of rock. A single purple,



(James's Press.)

KISKADEE (*Pitangus sulphuratus*).

A large member of the American family of Tyrant Flycatchers, whose name is derived from its call. In Spanish America this is interpreted as Buen-te-veo (I see you well) and in Brazil as Beintevi, with the same meaning.

AVES (ORDER PASSERIFORMES)



[Michael Sharland.]

SUPERB LYRE-BIRD (*Menura novaehollandiae*).

The female is without the extraordinary tail which, in the male bird, resembles the classical lyre.

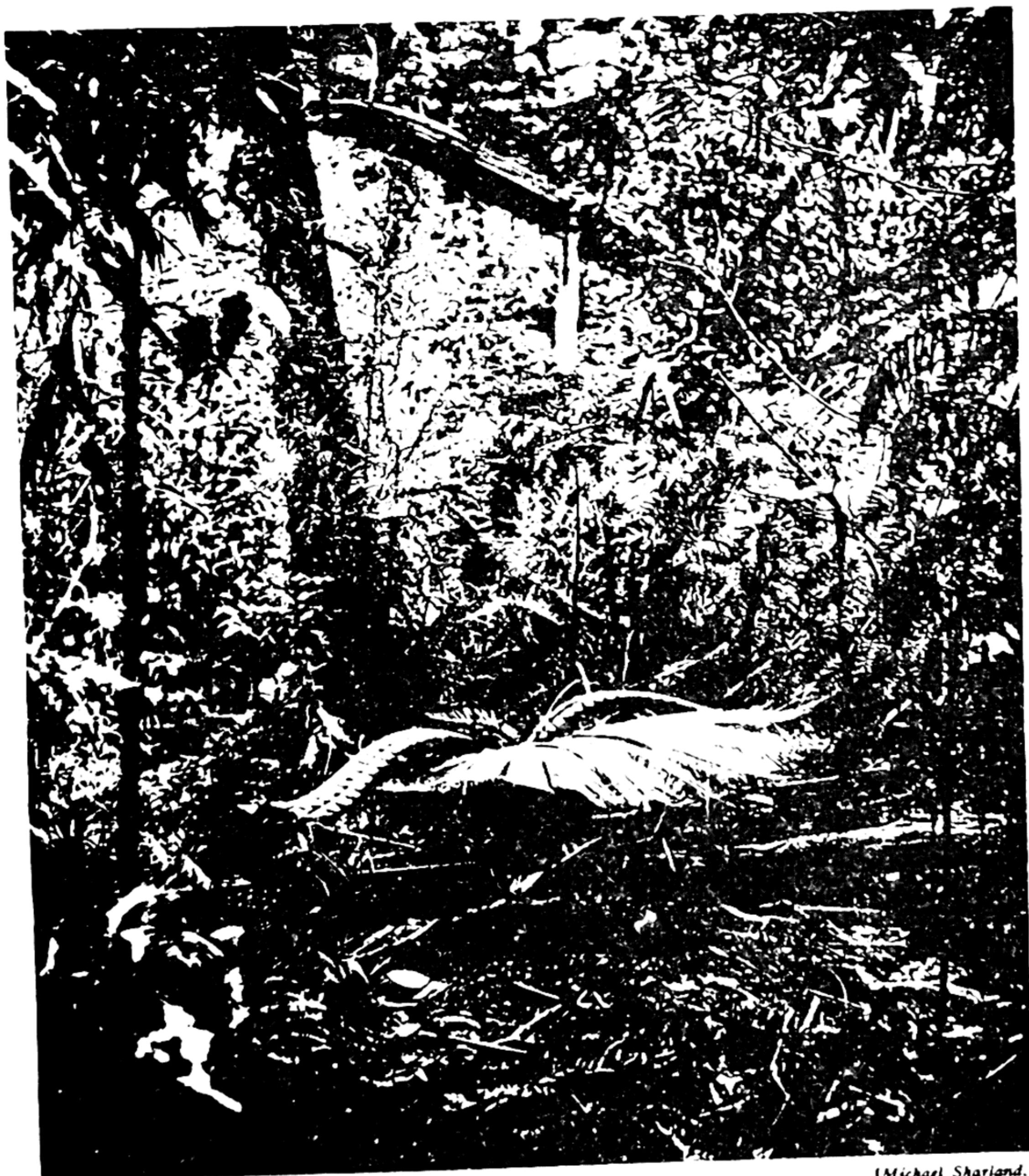
blotched egg is laid and the breeding season is the middle of winter. The cock bird clears small circular areas in the scrub, and scratches up in the clearing a low mound of earth on which, either alone or before an audience of one or more hens, he sings, dances, and spreads his remarkable tail. Lyre-birds are, perhaps, the most gifted vocalists of all birds; their notes are loud, clear and melodious and as mimics they are unrivalled. They incorporate in their songs not only the notes, songs and calls of other birds like the Mocking-birds, but almost every other sound, except the human voice, which they hear in their surroundings, such as the buzz of a circular saw, the whistle of a railway train, the howling of dingoes or the hammering of nails. The hen bird, though not so powerful a songster as the cock, is also an accomplished mimic.

Superb Lyre-bird (*Menura novaehollandiae*). This bird is found in the coastal forests from Victoria to southern Queensland. Both sexes are slaty-brown in colour. In the female, the tail-feathers are normal in structure, though very broad. In the male the central pair are very narrow, near their base they cross each other, and then diverge, bending round forwards near their tips; the next six feathers on each side are furnished on each side with hair-like barbs without barbules, about a quarter of an inch apart; whilst the outer pair have very broad inner webs of a chestnut

LYRE-BIRDS (MENURIDAE)

colour, marked with triangular, light-coloured transparent patches, and are bent first outwards, then inwards and then sharply outwards at the tip.

Albert Lyre-bird (*Menura alberti*). This Lyre-bird inhabits sub-tropical jungles in south Queensland and northern New South Wales. The plumage in both sexes is much more rufous than in the other species and the outer



[Michael Sharland.

SUPERB LYRE-BIRD (*Menura novaehollandiae*).
The male bird is here seen displaying on his dancing mound.

AVES (ORDER PASSERIFORMES)

tail-feathers of the male are shorter than the inner ones, uniform chestnut in colour and not curved.

Atrichornithidae (*Scrub-birds*). This family contains only two species, one formerly found in thickets in south-western Australia, now probably extinct, the other in sub-tropical jungles of northern New South Wales and south Queensland. They have rather large bills; extremely short wings with eleven primaries, the first of which is very small; fairly long, rounded tails of twelve feathers; and strong legs and feet. Their plumage is chiefly brown, and they live almost entirely on the ground among dense cover, being only capable of flying a few yards. Their notes are loud and they are clever mimics of the songs of other birds. The nest is dome-shaped, placed on the ground among dense vegetation, and the two eggs are pinkish-white with reddish-brown and purplish markings, chiefly at the larger end.

Hirundinidae (*Swallows*). The Swallows include numerous small birds with flattened, triangular bills, very wide at the base. They have very long, pointed wings with only nine visible primaries. The tails are of twelve feathers, more or less forked, sometimes with the outer feathers greatly elongated. The legs are very short and the feet, in which the three front toes are more or less united at the base, are weak. Swallows are found in all parts of the world except New Zealand, but those species which breed in the higher latitudes of both hemispheres migrate to the tropics or beyond in winter. They are entirely insectivorous, mainly capturing flying insects on the wing, and in pursuit of their prey they spend a great part of the daylight hours hawking about in the air. Their eggs are white, sometimes without markings, sometimes with spots, and they usually breed in colonies.

Swallow (*Hirundo rustica*). This is a summer visitor to Europe, northern Asia and North America, wintering in Africa south to Cape Colony, in tropical Asia and in tropical America. It is steel-blue above, with white spots on the tail-feathers, the outer pair of which are very long; its forehead, throat and upper breast are chestnut; the underparts varying in different races from white to chestnut, but usually buffy-white. Its nest is a saucer-shaped structure of mud, lined with feathers, usually placed on a beam or projection in a shed, barn or chimney, and its white eggs are spotted with reddish or ashy colour.

House Martin (*Chelidon urbica*). The House Martin has the upper parts, except the rump, blue-black; the rump and underparts being pure white. Its tail is forked, but the outer feathers are not specially elongated, and its legs and toes are covered with feathers. It is a summer visitor to Europe, north-west Africa and northern Asia, wintering in tropical Africa and Asia. Its mud nest is built on the vertical wall of a building under the eaves, or on a cliff below a projection, and is roofed over, with a small entrance near the top. Its eggs are pure white.

Sand Martin or Bank Swallow (*Riparia riparia*). This Martin lays its white eggs in a nest of feathers at the end of a burrow which it excavates

MARTINS, CUCKOO-SHRIKES, BULBULS

in the vertical face of a sand-pit, cutting or sandy river bank. It is uniform mouse-brown above and white below, with a brown band across the chest, and its tail is only slightly forked. It is found in summer throughout Europe, northern Asia and North America, wintering in the tropics.

Campophagidae
(*Cuckoo-shrikes*). This family includes numerous species found in Africa, tropical Asia, the Malay Archipelago and Australia. They have fairly strong, hooked bills, rather wide at the base; and rather long, pointed wings. The plumage is soft, but the shafts of the feathers on the rump are stiff and feel spiny when the bird is handled. Their nests are usually slight cups of sticks, very small in comparison with the birds, built near the end of a branch.

Pycnonotidae
(*Bulbuls*). The Bulbuls include numerous thrush-like species which are found throughout Africa and tropical Asia, extending north to Cyprus, Palestine, China and Japan, and east to the Moluccas. They have fairly long, somewhat stout, curved bills; rather short, rounded wings; and long, fluffy plumage on the rump. The majority are greenish or yellowish-brown above, often with bright yellow, orange or red on the underparts. They are mainly gregarious, arboreal birds of weak flight, frequenting gardens, orchards and thickets, and feeding on fruits and berries. Their notes are usually cheerful, mellow whistles, and it is probable that "the Bulbul" of Persian poetry was



[W. S. Berridge.]

SAND MARTIN (*Riparia riparia*).
The smallest British member of the Swallow family at the entrance to its nesting burrow excavated in a sand cliff.

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really a species of Nightingale and not a member of this family.

Timeliidae (Babblers). The Babblers include a large number of small or moderate-sized birds, mostly with dull-coloured, soft plumage; short, rounded wings; and fairly large, stout legs and feet. They are most numerous in tropical Asia, but occur also in Africa and Australia, and the majority are chiefly found on the ground in forests or thickets. It is very doubtful to what extent the various birds commonly associated in the family are really related, and it has been said that any Old World Passerine birds which cannot readily be placed in other families are relegated to the Timeliidae. The more typical Babblers commonly associate in small parties and thus are frequently known as "Seven Sisters" or "Apostle-birds."

Prunellidae (Accentors). The Accentors include about a dozen small birds found in Europe and Asia, with rather slender but hard bills, widened at the base, rounded wings, short legs and fairly strong feet. Most of them are found in mountainous districts, where they hop about on the ground or over rocks in search of spiders, small insects and seeds. They build open, cup-shaped nests and lay blue eggs.

Hedge Sparrow (*Prunella modularis*). This Accentor is found throughout Europe and is partially migratory, some visiting North Africa, Asia Minor and Syria in winter. It is a dull-brown bird, with greyish head, frequenting shrubberies and hedgerows.

Troglodytidae (Wrens). This family includes numerous small birds with fairly long, slender, compressed bills; short, rounded wings; and comparatively long legs. In the Wrens the sexes are alike and their plumage is always some shade of brown, usually more or less barred, generally lighter below.

Common Wren (*Troglodytes troglodytes*). This bird is found throughout Europe, northern Asia and north-west Africa, inhabiting almost every type of country from lowland gardens and hedges to rocky mountain-sides. Its very short tail is usually carried erect. It has an astonishingly loud song for so small a bird. Its nest of moss, dead grass, leaves, etc., lined with feathers, is placed in a variety of situations, usually



[Ralph Chislett.
COMMON WREN (*Troglodytes troglodytes*).

WRENS AND DIPPERS



(T. M. Forster.)

HEDGE SPARROW (*Prunella modularis*).

This familiar little bird with sparrow-like plumage is the British representative of the family of Accentors.

near the ground. The male builds a number of nests without lining them, and the female lines the one she selects, and lays from five to six or more eggs, white spotted with brownish red.

Cinclidae (*Dippers* or *Water Ouzels*). The Dippers include a small number of moderate-sized birds with slender bills, plump bodies, short wings and tails and rather long legs. They inhabit rivers and torrents in mountainous regions of Europe, northern Asia and western America from Alaska to Argentina. Their nests are bulky, domed structures of moss, with the opening at the side, usually built on rocks near waterfalls, and their eggs (five or six) are pure white. Though they show no special structural peculiarities to adapt them to an aquatic life, the Dippers swim and dive readily, and their food consists mainly of the larvae of aquatic insects obtained from the bottom of pools in rivers.

Common Dipper (*Cinclus cinclus*). This bird is found in most suitable localities in Europe, northern Asia and north-west Africa. In the British Isles it is common in Ireland, Scotland, Wales and northern and western England. Its plumage is mainly sooty brown, the throat and upper breast being pure white.

Paramythyidae. This family contains only one known species, *Paramythia montium*, found in the Astrolabe Mountains in south-eastern New Guinea. It is a dull-blue bird, with creamy head, black crest and fore-neck, olive-green rump, yellow vent and brownish wings.

Zeledoniidae. This family includes only the Wren-thrush (*Zeledonia coronata*), found near the summits of high volcanoes in Costa Rica and

AVES (ORDER PASSERIFORMES)

Panama. It is a very small bird, with a short bill with bristles at its base ; a short, rounded wing with the first primary minute ; a very short tail of only ten feathers ; and very long, slender legs. The sexes are alike, the upper parts being olive-green and the underparts slate-grey, with an orange-rufous patch on the crown.

Turnagridae (*New Zealand Thrushes*). In this family are only two species, found respectively in the north and south islands of New Zealand, the former now probably extinct and the latter very scarce. They have

stout, arched, compressed bills with bristles at the base ; rounded wings and tails of twelve feathers. Their plumage is olive-brown above with bright rufous on the tail ; paler below. The nest of sticks and moss is placed in a bush or tree, and contains two eggs, white with brown spots.

Mimidae (*Mocking-birds, Thrashers, etc.*). This family includes numerous moderate - sized birds found in North and South America, the West Indies and the Galapagos Islands, most numerous in Mexico. They have

(Arthur Brook.

DIPPER (*Cinclus cinclus*).

The bird is here seen outside its large domed nest, built on the rocks by a stream.

slender, rather long, usually somewhat curved, bills ; rounded wings and rather long, rounded tails.

Common Mocking-bird (*Mimus polyglottus*). This bird is found in the southern United States, Mexico and the West Indies, ranging north in small numbers to New York and New England. It is grey above and dull-white below, the wings and tail being blackish, the former with white bands and the latter with white margins. It is one of the finest song-birds, and, like the Nightingale, pours forth its song by night as well as in the daytime. Some individuals add to their own song imitations of the songs of many

THRUSHES AND CHATS

other birds, which are perfectly reproduced. The cup-shaped nest is a rather bulky structure placed in a bush or small tree, and the four to six eggs are bluish with reddish-brown spots.

Brown Thrasher (*Toxostoma rufum*). This bird of the eastern United States has the whole of the upper parts rufous and the underparts white, heavily streaked with black or brownish. It frequents thickets and undergrowth, but ascends trees to sing its melodious song, which is lacking in variety. The nest of this bird is built near or on the ground, and the three to six eggs are greyish white, thickly speckled with reddish-brown.

Turdidae (*Thrushes, Chats,* etc.). The family Turdidae includes a large number of small or moderate-sized birds found in all parts of the world except some of the Pacific islands. They have slender or small bills. Their plumage varies greatly, but the young of all species in their first plumage are spotted and different from the adults. The family contains many of the most noted song-birds.

Song Thrush (*Turdus philomelus*). The Song Thrush is brown above and buffy-white below, with dark-brown spots on the breast. It is found throughout Europe and western Asia, many moving south in winter to the countries round the Mediterranean. Its nest is a deep cup of grass, roots, etc., with a smooth inner lining of mud, usually built in a shrub or hedge,



[G. S. C. Ingram.]

SONG THRUSH (*Turdus philomelus*).

AVES (ORDER PASSERIFORMES)

and its four to five eggs are greenish-blue with scattered black spots. It feeds on snails, earthworms, insects and berries. In the British Isles its loud and pleasing song may be heard in almost every month of the year, its distinctive feature being the repetition of each phrase two or three times.

"Lest you should think he never could recapture
The first, fine, careless rapture."

Redwing (*Turdus musicus*). This is somewhat smaller than the Song Thrush, from which it may be distinguished by the conspicuous white line over each eye and the orange-red colour of the flanks and underwing-coverts. It breeds in Scandinavia, north Russia and Siberia and winters in the temperate parts of Europe and Asia, including the British Isles, where it is common at that season.

Missel Thrush (*Turdus viscivorus*). This Thrush is decidedly larger than the Song Thrush, its upper plumage is greyer, and the spots on its breast larger. Its loud, wild song lacks the variety of its smaller relative, the few phrases being constantly repeated. Its nest is lined with dry grass and its eggs vary from tawny to greenish-blue in ground colour, with blotches and spots of brown and lilac. It is found throughout Europe, western and central Asia and north-west Africa, in the southern parts of its range being confined to the mountains in summer.



[Tim Robinson.]

MISSSEL THRUSH (*Turdus viscivorus*).

The largest of the British Thrushes, whose loud song is most heard in boisterous weather in early spring, hence its alternative name of Stormcock.

FIELDFARE AND BLACKBIRDS

Fieldfare (*Turdus pilaris*). This is nearly as large as the Missel Thrush and is a much more handsome bird when seen at close quarters. Its head and rump are grey, its mantle chestnut-brown, its wings and tail dark brown, its breast golden-brown streaked with black and its belly white. It breeds in northern and central Europe and western Siberia and migrates southward for the winter, many visiting the British Isles. It is a social bird at all seasons, breeding in colonies, and moving about in flocks in winter, often in company with Redwings.

Blackbird (*Turdus merula*). The Blackbird is found throughout Europe, northern Asia and

North Africa. The male is entirely black, with an orange-yellow bill; the female is dusky brown, with a brown bill; and the young are dark brown and spotted. Its song is a mellow fluting. The nest is strengthened with mud but lined with grass, and the eggs are bluish-green, with reddish-brown freckles or spots.

Ring Ouzel (*Turdus torquatus*). This is a summer visitor to the mountainous and upland districts of Europe, including the British Isles, wintering in the Mediterranean region. The male has the whole plumage, except a broad white gorget, brownish black, the feathers, however, have pale margins, giving the bird a somewhat grey appearance. The female is similar but duller and browner in colouring and her gorget is smaller and duller white. The Ring Ouzel's nest and eggs are similar to those of



(L. J. Langford.

BLACKBIRD (*Turdus merula*).
"The ouzel cock so black of hue with orange-tawny bill."

AVES (ORDER PASSERIFORMES)

the Blackbird, but are usually placed in heather or juniper bushes or among stones on rough banks in moorland country.

American Robin (*Turdus migratorius*). This bird has the top and sides of the head black, the throat white with black streaks, the upper parts grey, the underparts rufous, and the bill yellow. In summer it is found throughout Canada and the eastern United States, wintering in the central and southern States. Its song and its nest closely resemble those of the Blackbird, but its greenish-blue eggs are generally unspotted.



[Stanley Crook.

RING OUZEL (*Turdus torquatus*).

A shy relative of the Blackbird, which breeds in moorland districts of the British Isles.

Nightingale (*Luscinia megarhyncha*). The Nightingale has the upper parts rufous-brown, brightest at the base of the tail, the underparts dull-white, brownish on the breast. It inhabits woods and thickets and its nest of dead leaves lined with grasses is built on or close to the ground. It lays from four to five greenish or olive-brown eggs. In summer it is found in central and southern Europe, north-west Africa and parts of western Asia east to Turkestan, wintering in tropical Africa. In the British Isles it is confined to southern and eastern England and the midland counties. Its very powerful and wonderfully varied song is poured forth almost continuously day and night for a few weeks in the spring, rarely being heard after the middle of June.



[Tom Robinson.

STONECHAT (*Saxicola torquata*).

The male, here seen at the nest, is a handsome little bird with its black head, white collar, and reddish breast.



[Stanley Crook.

WHEATEAR (*Oenanthe oenanthe*).

One of the earliest of the summer migrants to return to the British Isles in spring, arriving towards the end of March.

AVES (ORDER PASSERIFORMES)

Robin Redbreast (*Erithacus rubecula*). The Robin is uniform olive-brown above, the face, throat and breast reddish-orange with a border of bluish-grey, and the rest of the underparts white. It is found throughout Europe and western Asia, those from the north wintering in the Mediterranean countries and Persia. In the British Isles it is found throughout the year, and its boldness and tameness make it one of the most familiar and favourite birds. Its nest is built in a hole in a bank, stump or wall,

generally near the ground, and its five, six or more eggs are white with fine freckles of sandy-red.

Redstart (*Phoenicurus phoenicurus*). This bird is a summer visitor to Europe and western Asia, but winters in tropical Africa. As a breeding species it is widely distributed in the British Isles, frequenting woods, parks and gardens where there are old trees, its nest being usually built in a hollow tree or a hole in a wall. The eggs are light blue and usually six in number. In south-eastern England, where it was formerly common, it has become unaccountably scarce in recent years, and in Cornwall, western Wales and most parts of Ireland it is almost unknown. The male has a white forehead, black chin, throat and cheeks, grey crown, nape and upper back, brown wings and chestnut breast, rump and tail. The



[Oliver G. Pike.

WHINCHAT (*Saxicola rubetra*).
The conspicuous white eyebrow distinguishes this species from its more familiar relative the Stonechat.

female is a grey-brown bird with a chestnut tail. Both sexes have a habit of shivering their brightly-coloured tails, and the male has a brief but pleasant song.

Stonechat (*Saxicola torquata*). This bird is found throughout the greater part of Europe, Asia and Africa. In the British Isles it is generally distributed in summer, chiefly frequenting gorse-covered commons and wastes. Many remain for the winter but others migrate southwards. The male has the whole head black, a white collar on the sides of the neck and a conspicuous white patch in the wing, the breast bright rufous, the rest of



[Reginald Gate.

NIGHTINGALE (*Luscinia megarhynchos*).

This far-famed songster sings much in the daytime, not only at night as supposed by many, including Shakespeare.



[M. H. Crawford.

ROBIN REDBREAST (*Erithacus rubecula*).

The most persistent of British songbirds, singing in every month of the year.

AVES (ORDER PASSERIFORMES)

the plumage dark brown, spotted with black on the back. The female lacks the black head and is altogether duller in colouring. The nest is built near the ground, generally under a thick bush, and the five or six eggs are bluish-green with reddish-brown spots.

Whinchat (*Saxicola rubetra*). This bird has the upper parts mottled with dark brown and buff, a conspicuous white stripe over each eye and a white patch on each side of the base of the tail, and the underparts buff, with a rufous tinge on the breast. The female is similar to the male but duller. It is a summer visitor to Europe and western Asia, including the



[Stanley Crook.

BLACKCAP (*Sylvia atricapilla*).
The finest songster among the British Warblers.

British Isles, wintering in northern tropical Africa. It frequents heaths, commons and pastures, placing its nest on or close to the ground among dense herbage. The eggs, usually six in number, are greenish-blue, sometimes with rust-coloured spots.

Common Wheatear (*Oenanthe oenanthe*). The Wheatear is a small long-legged bird which frequents mountain-pastures, downs and grassy dunes, and in the summer is found in Europe, north Africa, northern and central Asia and Alaska, wintering in tropical Africa and India. It is brownish or greyish above and buffy-white below, with the rump and base of the tail pure white and the wings and tip of the tail black. Its nest is placed in a



[M. H. Crawford.]

LESSER WHITETHROAT (*Sylvia curruca*).

Distinguished from its larger relative by its greyer upper parts, blacker cheeks and quite different song.



[T. M. Fowler.]

CHIFFCHAFF (*Phylloscopus collybita*).

The earliest of the Warblers to return in spring, its well-known notes, from which it takes its name, are eagerly awaited in England.

AVES (ORDER PASSERIFORMES)

hole in the ground or a cavity among stones, and its five to seven eggs are pale blue.

Sylviidae (Warblers). The Warblers include a large number of small birds distributed throughout the eastern hemisphere, the majority of those found in Europe and northern Asia migrating to warmer regions for the winter. They mostly have rather weak, slender bills and comparatively short wings and the greater number are comparatively sombrely coloured, brown, grey or greenish being the predominant tints. Most species feed principally on small insects, but some are fond of berries.

Blackcap (*Sylvia atricapilla*). The Blackcap is greyish-brown above



[Reginald Gaze.

WILLOW WARBLER (*Phylloscopus trochilus*).
This sweet songster is here seen bringing a spider as food for its nestlings.

and greyish-white below. The top of the head is black in the male, reddish-brown in the female. It is a summer visitor to most of Europe and western Asia. In the British Isles it is common in summer in England, but is only found in a few localities in Ireland and southern Scotland. In the countries round the Mediterranean it is found throughout the year. It is a very fine songster, pouring out its rich, melodious notes, which are loud for the size of the bird, from the shelter of a thicket or a leafy tree.

Garden Warbler (*Sylvia borin*). This bird is olive-brown above and buffish-white below. It is a summer visitor to most of Europe and western Asia, wintering in tropical and southern Africa. In the British Isles it is more widely distributed than the Blackcap, its range extending to southern Scotland and some districts of Ireland. In spite of its trivial name, it

WARBLERS (SYLVIIDAE)



[R. T. Littlejohns.
SUPERB BLUE WREN.
(*Malurus cyaneus*).

The male of this striking little Warbler has the plumage of the head, back and tail of various shades of blue.

is widely distributed in Europe including the British Isles, and western Asia, wintering in Africa. It frequents hedges and bushy localities, and has a loud, babbling song often uttered as it rises vertically into the air.

Lesser Whitethroat (*Sylvia curruca*). This has the head grey with the sides of the face nearly black, the upper parts brownish grey and the underparts white. In summer it inhabits temperate Europe and northern

inhabits woods and thickets more often than gardens, and though it has not such a variety of notes as the Blackcap, its song is much more continuous.

Whitethroat (*Sylvia communis*). This little bird has the head grey, the upper parts brown, rufous on the wings, the underparts greyish-white, with a pink tinge on the breast and the throat pure white. In summer it



By courtesy of]

(the Commonwealth of Australia.
SUPERB BLUE WREN (*Malurus cyaneus*).

The female has only blue in the tail. The species is common in Tasmania and south-eastern Australia.



[F. M. Fowler.]
WHITETHROAT (*Sylvia communis*).
 One of the commonest British Warblers often called the Nettle Creeper from its liking for the tangled weeds along the hedgerows.



Photos]
SEdge WARBLER (*Acrocephalus schoenobaenus*).
 Like the Nightingale this bird often sings at night, but its harsh, babbling chatter is very distinct.

WARBLERS (SYLVIIDAE)

and central Asia and in winter is found in tropical Africa. In the British Isles it breeds commonly in England, but is almost unknown in Scotland and Ireland. It frequents hedgerows and copses and has a low babbling song only audible at a short distance with a loud rattling refrain uttered at intervals.

Dartford Warbler (*Sylvia undata*). This bird is a resident in the south of England, south-western Europe and north-west Africa, frequenting furzy commons and bushy heaths. Its upper parts are dark slaty grey, its breast reddish-brown and its long tail has white margins and tips. The eggs, four or five in number, are greenish-white, with brown markings.

Chiffchaff (*Phylloscopus collybita*). The Chiffchaff is found in summer throughout Europe and northern Asia, wintering in south-western and southern Europe, Africa and tropical Asia. It is a very small bird, brownish above and whitish below, more or less tinged with yellow. It is one of the earliest of the summer visitors to arrive in the British Isles, a few even spending the winter in southern England. It is readily recognized by the notes from which it obtains its name, chiff-chaff-chiff, etc., constantly repeated.

Willow Warbler or Willow Wren (*Phylloscopus trochilus*). This Warbler closely resembles the Chiffchaff, but is rather larger and yellower. In summer it is found throughout Europe and northern Asia, retreating further south than the Chiffchaff in winter. It has a sweet warbling song, the first few notes in an ascending scale and then descending till they fade away.

Wood Warbler or Wood Wren (*Phylloscopus sibilatrix*). This bird is somewhat larger than the Willow Wren with the upper parts yellowish-green, the breast sulphur-yellow and the belly white. It is a summer visitor to Europe which winters in tropical Africa. In the British Isles it is widely distributed, chiefly frequenting woods in which there is not much undergrowth. It has a characteristic shivering song, during the utterance of which it rapidly vibrates its wings, and also produces a loud, plaintive two-syllabled call, constantly repeated.

Grasshopper Warbler (*Locustella naevia*). This is a little brownish bird, more or less streaked, remarkable for its song, which is a continuous trill resembling the sound made by an angler's reel when the line is running off it. This species frequents thickets, especially in swampy localities, and in summer is found throughout Europe and western Asia, wintering in Africa.

Reed Warbler (*Acrocephalus scirpaceus*). This bird has the upper parts brown tinged with chestnut and the underparts buffish white. It ordinarily inhabits beds of reeds and attaches its deep nest to a number of reed stems, but sometimes nests in other situations. It is a summer visitor to the greater part of Europe and western Asia, wintering in Africa, but in the British Isles is confined to England and Wales.

AVES (ORDER PASSERIFORMES)



(T. M. Fowler.

SPOTTED FLYCATCHER (*Muscicapa striata*).

A well-known summer visitor to the British Isles, conspicuous from its habit of perching on posts or rails in the open.

Marsh Warbler (*Acrocephalus palustris*). This closely resembles the Reed Warbler, but is not so chestnut above and rather yellower below. It inhabits osier-beds and thickets and in summer is distributed over Central and Southern Europe, wintering in tropical Africa. In the British Isles it breeds only in southern England, principally in the Severn Valley.

Sedge Warbler (*Acrocephalus schoenobaenus*). This bird has the upper parts rufous, mottled with dark brown, a broad yellowish-white stripe over each eye and the underparts buff. It occurs in summer throughout Europe and western Siberia, wintering in tropical and southern Africa. In the British Isles it is almost universally distributed, chiefly frequenting the tangled vegetation on the banks of lakes, rivers and streams.

Muscicapidae (*Flycatchers*). The Flycatchers include numerous small insect-eating birds with flattened bills, wide at the base, which is surrounded by bristles. As in the Thrushes, the feathers of the nestlings are mottled. They are confined to the eastern hemisphere, where they are plentiful in Africa, tropical Asia, the Malay Archipelago and Australia some occurring in New Zealand and the Pacific islands and a few visiting Europe and northern Asia in the summer.

Spotted Flycatcher (*Muscicapa striata*). This bird is brown above and dull white below, with dark streaks on the breast. It is found in summer throughout Europe, including the British Isles, and western Asia, wintering in central and southern Africa. The birds commonly perch on the rail of a fence, a post or a bare bough from which they have a clear view, flying out at intervals to capture an insect with an audible snap of the bill and usually returning to the same perch. The nest is a slight cup, generally built on a ledge or bough against a wall or tree trunk, and the eggs are greenish with reddish-brown spots.

FLYCATCHERS, VIREOS AND WAXWINGS

Pied Flycatcher (*Muscicapa hypoleuca*). This Flycatcher is also a summer visitor to Europe and western Asia from tropical Africa, but in the British Isles is almost confined to northern England and Wales. The male is black above, with white on the forehead and in the wings and tail, and with white underparts. The female is mainly brown above. The nest is built in a hole in a tree or wall and the eggs are pale blue without spots.

Vireonidae (*Vireos or Greenlets*). This family includes a considerable number of small birds, mostly found in tropical America, some of them visiting temperate North America in summer. They have rather stout, notched bills, higher than broad at the base, hooked at the tip. Their upper plumage is generally greenish.

Red-eyed Vireo (*Vireosylva olivacea*). This bird is found in summer almost throughout North America and winters in South America. Its head is grey, bordered by black, with a white line over the eye; the upper parts are olive-green and the underparts white, whilst the eye is red. The cup-shaped nest is suspended from a forked branch and the three to four eggs are white, with a few dark spots at the larger end.

Bombycillidae (*Waxwings*). The Waxwings include only three species, one found in North America, one in north-eastern Asia, and the third breeding in high northern latitudes in both hemispheres and wandering southward in winter. Waxwings have short, thick bills, wide at the base and slightly hooked at the tip; long crests; long wings; short tails and very short legs.

Bohemian Waxwing (*Bombycilla garrulus*). This is the third of the species mentioned above. Its plumage is cinnamon-



[J. E. Ruxton.
PIED FLYCATCHER (*Muscicapa hypoleuca*).
In the British Isles this species is almost confined to the wooded valleys of Wales and northern England.

AVES (ORDER PASSERIFORMES)

brown, varying to brownish-grey and to chestnut, relieved with black, white and yellow. The tail is black, tipped with yellow. In old birds the secondaries, and occasionally also the tail-feathers, have the tips of the shafts projecting beyond the barbs and somewhat enlarged, coloured bright 'sealing-wax' red. This species is a very erratic migrant, large flocks appearing in winter in various parts of the United States and Europe, including the British Isles, at intervals of years. At this season they feed greedily on berries.

Ptilogonatidae (*Silky Flycatchers*). This family consists of a few small, arboreal birds, distributed from the south-western United States to Costa Rica. They have small, broad bills, very wide at the base, which is surrounded by bristles. Their wings are rather short and rounded; their tails long and fan-shaped; and their plumage silky, with plain but often handsome, blended colours.

Dulidae (*Palm-chats*). This family includes one or two species found in Haiti. They have short, stout, curved, compressed bills; rather long, rounded wings; short tails and strong feet. Their plumage is olive-brown above, yellowish-white below, with conspicuous dusky streaks. Their food consists of fruits and insects, and they chiefly frequent palm-trees, in which they construct enormously bulky nests of sticks, said to be utilized jointly by several pairs.

Artamidae (*Wood-swallows* or *Swallow-shrikes*). The Wood-swallows include a number of small birds, mostly found in Australia, extending through the Malay region to India and also to the Fiji Islands. They have longish, pointed, slightly curved grey-blue bills, wide at the base; long, pointed wings; short tails; and short, stout legs. In most of the species grey is the predominant colour, often varied with areas of black and white. Their food consists almost entirely of insects captured on the wing, and they either sail about in the air like swallows or fly out from a perch like flycatchers. They build rather slight, cup-shaped nests, and lay from two to four greenish or pinkish eggs, with dark markings. They are very sociable birds, almost always found in flocks, and many pairs often nest in close proximity.

Dusky Wood-swallow (*Artamus cyanopterus*). This bird, of southern Australia and Tasmania, has the strange habit of roosting in clusters, some birds hanging on a branch and many others clinging on to them in a compact mass like a swarm of bees.

Vangidae (*Madagascar-shrikes*). This family includes a few birds found in Madagascar, with stout, curved, strongly-hooked bills. Most of them are mainly black and white in colouring.

Grallinidae. This family contains only the Magpie-lark (*Grallina cyanoleuca*) of Australia and an allied species from New Guinea. The Magpie-lark is a moderate-sized black and white bird, with a yellow bill and exceptionally long legs, which spends much of its time running about

WOOD-SWALLOWS AND MAGPIE-LARK

on the ground feeding on snails and insects. It has a curious flapping flight, somewhat resembling that of the Lapwing, and a loud call-note which earns it the name of "Peewee" in some localities. It builds a large, bowl-shaped nest of mud, generally on the bare horizontal limb of a tree, and lays three or four pinkish eggs marked with red and purple.

Prionopidae (*Wood-shrikes*). The Wood-shrikes include a number of



[*Oliver G. Pike.*

RED-BACKED SHRIKE (*Lanius collurio*).

One of the handsomest of the smaller English birds with its blue grey head, chestnut back, rosy white breast, black wings and black and white tail.

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birds with slightly hooked bills and dull plumage, mainly black, grey or brown. They are found in Africa, tropical Asia, the Malay Archipelago, Australia and some of the Pacific Islands, where they mostly frequent forest country.

Grey Shrike-thrush (*Colluricincla harmonica*). As its name implies, this is a grey bird about the size of a thrush. Its song is loud and melodious. It builds a large, cup-shaped nest near the ground, and lays from three to four pearly-white eggs, spotted with grey and greenish.

Aerocharidae. This family contains only the Helmet-bird (*Aerocharis prevosti*), restricted to north-eastern Madagascar. It has a long, compressed bill, with the upper mandible hooked at the tip and very much elevated and dilated at the base. The sexes are similar in colour, the head, neck and underparts being glossy black, the upper parts mainly chestnut.

Cyclarhidae (Pepper-shrikes). The Pepper-shrikes include a few tropical American birds with short, stout, compressed bills, somewhat curved and

slightly hooked at the tip. Their plumage is greenish above and yellowish below, with a brownish or greyish band on the crown, bordered by stripes of reddish or cinnamon colour.

Vireolaniidae (Shrike-vireos). In this family are a few small birds, found in tropical America. They have large, elongated bills with hooked tips; rather short, rounded wings; short tails and rather long legs. Their plumage is green above, yellow or white below.

Streperidae (Crow-shrikes). The Crow-shrikes include a number of fairly large



[R. T. Littlejohns.
YELLOW SHRIKE-ROBIN (*Eopsaltria australis*).
A familiar and confiding bird in eastern Australia, with grey head, greenish-brown back and lemon-yellow breast. It always decorates its nest with hanging strips.

SHRIKES OR BUTCHER-BIRDS



[Robert McLeod.]

GREAT TIT (*Parus major*).

Also known as Ox-eye, from the large white patches on the cheeks. This species is common in most parts of the British Isles.

perching birds with strong bills, slightly hooked at the tip. They occur in Australia and New Guinea.

Black-backed Magpie (*Gymnorhina tibicen*). This bird is widely distributed in eastern and northern Australia. It is a black and white bird as large as a Jackdaw, sometimes called the "Piping Crow" from its fine flute-like warblings.

Laniidae (*Shrikes or Butcher-birds*). The Shrikes include moderate-sized birds with strongly-hooked, hawk-like bills, rounded wings, fairly long tails of twelve feathers and rather short legs. They are numerous in Africa and tropical Asia, and a few occur in Europe, northern Asia and North America. Their food consists of large insects, frogs, reptiles, small birds and small mammals, and they have the curious habit of impaling their victims on thorns, whence they are often called Butcher-birds.

Red-backed Shrike (*Lanius collurio*). This is a summer visitor to Europe and western Asia, wintering in Africa. In the British Isles it breeds in England and Wales, but is only an occasional visitor to Scotland and Ireland. The male has the crown and nape blue-grey, the sides of the head with a black band, the back chestnut-red, the wings black, the tail black with white edges and the underparts rosy white. The female is brownish-grey above and dull white below. Its rather large, cup-shaped nest is

AVES (ORDER PASSERIFORMES)

placed in a bush and the eggs vary in ground-colour from greenish to salmon, with violet and brownish spots.

Regulidae (*Kinglets and Gnatcatchers*). This family includes a number of very small, arboreal birds, with thin, slender bills and comparatively long wings, rounded at the tip. They are found in Europe, northern Asia and North and South America.

Golden-crested Wren (*Regulus regulus*). This is a very small bird with greenish upper parts and greyish underparts tinged with yellow. In the centre of the crown there is a broad yellow stripe, orange in the centre in the male, bordered with black on each side. The Goldcrest is found throughout Europe and northern Asia, frequenting forests and woods of coniferous trees. In winter the northern forests are deserted and large numbers appear in the southern part of its range. It builds a hanging nest of moss, lined with feathers, suspended from the bough of a fir or yew-tree, and lays from seven to ten or more tiny, buffish-white eggs, with fine spots of brown at the larger end.

Chamaeidae contains only the Wren-tit (*Chamaea fasciata*) of California and Oregon. It is a small bird, with a short, curved, compressed bill with bristles at the base; short, rounded wings; a fairly long tail, commonly carried erect; and comparatively long legs. Its plumage is brown above and buffish below. It inhabits thickets, where it lives much on the ground, and builds an open nest of twigs and grass in a low bush, laying from three to five greenish-blue eggs.

Paridae (*Titmice or Tits*). The Tits comprise a large number of small birds, with short, stout rounded bills and fairly long, rounded wings in which the fourth or fifth primary is the longest and the first is small, sometimes rudimentary. They are found in all parts of the world except South America, the Pacific Islands and New Guinea, though it seems doubtful whether the Australian and New Zealand birds generally placed in the family are really related to the typical Tits.

Great Tit (*Parus major*). This bird occurs throughout Europe and northern Asia and in north-west Africa. It has the crown, the sides of the neck, the throat and a broad line down the centre of the breast, black; the cheeks, white; the back, yellowish-green; the rump, grey; the wings and tail, greyish-black, with some white markings, and the breast, yellow. It is a lively and active bird, inhabiting woods, orchards and gardens, clinging to the boughs and twigs of the trees in any position which enables it to scan the bark or the foliage for the small insects on which it chiefly feeds. Its nest is built in a hole in a tree or wall, and it lays from six to ten white eggs, spotted with red.

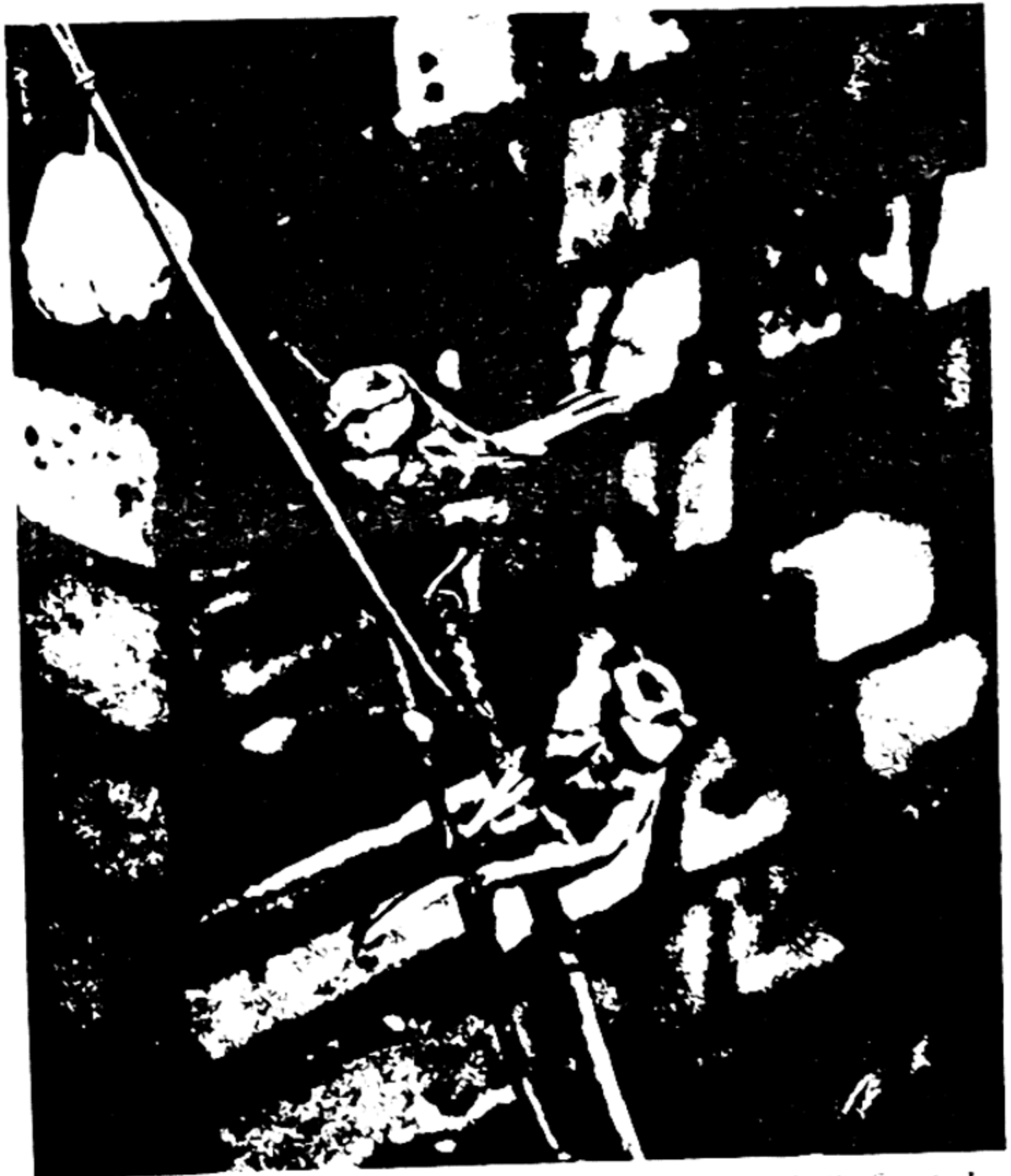
Blue Tit (*Parus coeruleus*). This is a smaller bird, with very similar habits. Its head is blue and white and its rump and breast yellow, the rest of its plumage resembling that of the Great Tit. It occurs throughout Europe, in western Asia and in north-western Africa.

TITMICE OR TITS (PARIDAE)

Coal Tit (*Parus ater*). This is still smaller than the Blue Tit, and has the head black with white patches on the cheeks and nape. Its back is grey and its breast dull white. It inhabits forests and woods throughout Europe, a great part of Asia and northern Africa and is widely distributed in the British Isles, where it is specially partial to pine-woods and plantations.

Marsh Tit (*Penthestes palustris*). This bird has the crown and nape glossy black, the upper parts greyish-brown, the chin black and the underparts buffish white. It occurs throughout northern and central Europe and in western Asia and Siberia. In the British Isles it is confined to England, and frequents woods and hedgerows as well as swampy localities.

Willow Tit or Chickadee (*Penthestes atricapillus*). This closely resembles the Marsh Tit, but the crown is dull black instead of glossy, and in most parts of its range its back is greyer. It is widely distributed in Europe, northern Asia and North America, but in the British Isles is comparatively scarce, though found in many parts of England and Scotland.



[M. H. Crawford.

BLUE TIT (*Parus coeruleus*).

These birds are readily attracted to fat, coconut or monkeynuts hung out for them.

Crested Tit (*Lophophanes cristatus*). This bird is an inhabitant of pine-forests in most parts of Europe, but in Britain is confined to those of the Spey Valley and adjacent parts of Scotland. The head is mottled with black and greyish-white, the feathers of the crown being elongated to form a conspicuous crest, the throat and upper breast are black, the upper parts brown and the underparts dull white.

Long-tailed Tit (*Aegithalos caudatus*). This Tit has an extremely small body and a very long tail in proportion. Its plumage is mainly black and white, but some races, especially that inhabiting the British Isles, have a

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rosy tinge. It occurs throughout Europe and northern Asia. Its domed nest is a large ovoid structure of moss and lichens, lined with feathers, with a small entrance near the top, and is placed in a shrub or tree.

Bearded Tit or Reedling (*Panurus biarmicus*). This bird has a blue-grey head and whitish cheeks and throat, most of the rest of the plumage being russet, varied with some black and white. The male has a black moustache-mark on each side of the face. It inhabits reed beds in many parts of Europe and northern Asia, but in the British Isles is now only

found in Norfolk. Its round nest of dead reeds and dry grasses is built near the base of the reeds.

Hyposittidae. This family contains a single species confined to Madagascar, the Coral-billed Nuthatch (*Hypositta corallirostris*). It has a short, stout beak, somewhat hooked at the tip, with stout bristles at the base. Its plumage is mainly blue and its bill, coral-red.

Sittidae (*Nuthatches*). The Nuthatches include a number of small birds, with rather long, stout, straight bills; longish wings; short tails; short legs and large feet, the toes with large,



[T. M. Fowler.

NUTHATCH (*Sitta europaea*).

This bird nests in holes and if the entrance is too large it partly blocks it up with mud, leaving a hole of suitable size.

laterally-compressed claws. They are found in Europe, Asia, Australia and North America, in forests and wooded regions, running actively about on tree trunks and branches, indifferently upwards, sideways or downwards, holding on to the irregularities of the bark by their strong feet. They feed largely on nuts, which they fix into crevices of the bark and split open to get at the kernels by hammering the shells with their powerful beaks, but insects and berries are also eaten.

Common Nuthatch (*Sitta europaea*). This bird has the upper parts blue-grey and the underparts buff or white, with chestnut flanks. It is found

NUTHATCHES AND CREEPERS

throughout most of Europe and northern Asia, but in the British Isles is almost confined to England, only occasionally visiting Scotland and never found in Ireland.

Certhiidae (Creepers). This family comprises a few small birds found in all parts of the world except South America, Madagascar, New Zealand and the Pacific Islands. They have long, slender bills, usually somewhat curved; their legs are short; the toes are unequal in length, the outer much longer than the inner; and the claws are very strong, that of the hind toe as long as the toe itself.

Common Tree-creeper (*Certhia familiaris*). This is an inconspicuous little bird, whose plumage is mottled brown above and white below. It climbs up the trunks of trees searching for insects in the crevices of the bark, helping to support itself by its tail, the feathers of which are stiff and pointed as in the Woodpeckers. It is found in woodland districts of Europe (including Britain), northern Asia and North America.

Zosteropidae (White-eyes or Silver-eyes).

This family includes numerous species of

very small birds found in Africa, southern Asia and Australia, and in most of the islands of the Indian and Pacific Oceans. Their plumage is alike in both sexes and is either brown or green above, white or yellowish below, and a conspicuous ring of small white feathers surrounds each eye. They are Tit-like in habit and feed on insects and berries, build slender, cup-shaped nests in trees or bushes and lay pale blue unspotted eggs.

Grey-backed Silver-eye (*Zosterops halmaturina*). This bird, of southeastern Australia and Tasmania, is noteworthy because in 1856 it appeared in the South Island of New Zealand; it soon spread throughout that island



[T. M. Fowler.

LONG-TAILED TIT (*Aegithalos caudatus*).

This little bird builds a wonderfully neat domed nest of moss and lichen, warmly lined with feathers.

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and into the North Island, and subsequently spread to the Chatham Islands.

Dicaeidae (*Flower-peckers and Diamond-birds*). This family includes some very small birds, mostly brilliantly coloured, inhabiting tropical Asia, the Malay Archipelago and Australia. The majority have short, broad, flattened bills; longish wings and short tails. They are mainly arboreal in habits, feeding on insects, spiders, berries and seeds. Their nests are generally domed, sometimes suspended from boughs and sometimes placed in holes, and their eggs are usually white.

Promeropidae. This family contains only the Long-tailed Sun-bird (*Promerops cafer*) of South Africa. It is a small bird, with a long, curved bill; a grooved tongue with frayed edges; and a very long tail. Its plumage is greyish-brown above, mottled white below, the vent is yellow. It usually congregates in small parties on flowering trees, especially Proteas, to obtain the honey from the blossoms. It builds an open, cup-shaped nest and its eggs are creamy-white, marked with wavy lines of purplish colour.

Nectariniidae (*Sun-birds*). The Sun-birds include numerous small birds with long, slender, curved bills and long, protractile tongues which end in a tube, bifid at the tip. They have brilliant metallic colours in their plumage and are sometimes regarded as representing Humming-birds in the Old World, being frequently called 'Humming-birds' in India. Sun-birds are found throughout tropical and southern Africa, including Madagascar, and in tropical Asia and the Malay Archipelago, east to New Guinea, one species extending to north-eastern Australia. The family is also represented by single species in Baluchistan and southern Persia, Arabia and the Jordan valley in Palestine. Sun-birds flit rapidly about among flowering trees and shrubs, extracting honey from the flowers, also feeding largely on small spiders and insects. They build woven, domed nests, felted together with cobwebs, suspended from boughs, and lay eggs (two) with a greyish ground-colour, freckled or spotted with reddish-brown, purplish or dusky.

Meliphagidae (*Honey-eaters*). The Honey-eaters include a large number of small, or moderate-sized, birds, found in Australia, New Zealand, the eastern part of the Malay Archipelago and many of the Pacific Islands. Their bills are always somewhat curved, usually fairly short, but sometimes very long; their tongues are extensile, divided at the tip, each half broken up into a brush of horny fibres. They vary greatly in size, form and appearance, but nearly all are lively, pugnacious birds, frequenting trees or bushes, feeding on berries, insects and honey obtained from the flowers by means of their brush-like tongues. Their nests are almost always rather slight, cup-shaped structures, suspended by their edges in the fork of a bough, and their eggs are salmon-pink or white with reddish, grey or black markings.

Blood-bird (*Myzomela sanguinolenta*). This is a small species found in

HONEY-EATERS AND WOOD WARBLERS

eastern Australia, with a long, curved bill. The male has the head and body brilliant scarlet, with black wings and tail ; the female is brown.

Red Wattle-bird (*Acanthochaera carunculata*). This bird of southern Australia is one of the largest species, fourteen to fifteen inches in length. Its plumage is greyish-brown streaked with white, with a patch of yellow on the abdomen, and on each cheek it has a blood-red lobe or wattle of pendulous skin, from which it derives its name.

Parson-bird or Tui (*Prothemadera novae zealandiae*). The Tui of New Zealand and the Chatham Islands is another of the larger forms, about twelve inches in length. Its plumage is bluish or greenish-black, with metallic reflections ; there is a white spot on each wing, and the throat has two extraordinary tufts of white, curly feathers.

Mniotiltidae (*American or Wood Warblers*). The Wood Warblers include about one hundred and fifty species of small birds, mainly arboreal in habits, found only in America. Their bills are usually slender and sharply pointed ; the first primary is well-developed, being nearly, or quite, as long as the second and third ; and the tail is usually square but sometimes rounded. Though green and yellow tints predominate in their

plumage some are brilliantly coloured, and in their breeding plumage most of the males exhibit some bright colours. Wood Warblers are almost entirely insectivorous, and in winter most of the species retire to the tropics, but in the spring and early summer immense numbers travel northwards in mixed flocks to breed in the forests of the United States and Canada. Several species have fine songs, but the majority have only feeble voices. The majority build cup-shaped nests in trees or bushes and lay from two to six eggs, usually with a creamy ground-colour, more or less spotted or blotched with reddish-brown, grey or black.

Black and White Creeper (*Mniotilta varia*). This bird is streaked with black and white above and below. It is found in summer throughout eastern North America, wintering in the tropics. It runs up the trunks of trees and hangs from the branches with the agility of a creeper and a tit combined.



[D. Seth-Smith.
SPINY-CHEEKED HONEY-EATER (*Acanthagenys rufogularis*).
This member of the family of Honey-eaters, found throughout Australia, has
a tuft of curious stiff feathers on each cheek.

AVES (ORDER PASSERIFORMES)

Myrtle Warbler (*Dendroica coronata*). This Warbler is bluish-grey, streaked with black, above ; and white below, with black marks on the breast ; the crown, rump and a patch on each side of the breast are yellow ; there are two white bars in the wing and white spots on the outer tail-feathers. It breeds from Alaska throughout Canada to New England, and though the majority winter in the West Indies and Central America, many remain in the United States, feeding on the berries of bayberry and myrtle.

Drepanididae (*Hawaiian Honey-eaters*). This family includes a number of species, many of them now extinct, only found in the Hawaiian Islands. Their bills differ extraordinarily in form, but all have a more or less tubular tongue, split or frayed at the end. Many of the males have brilliant plumage and their feathers were formerly used to make the wonderful feather-cloaks and other ornaments of the Hawaiian chiefs. The females are generally duller in plumage. They are chiefly inhabitants of the mountain forests, where they creep about on the trees, probing crevices for insects and sucking honey from the flowers. Many also feed on berries. Little is known of their breeding habits.

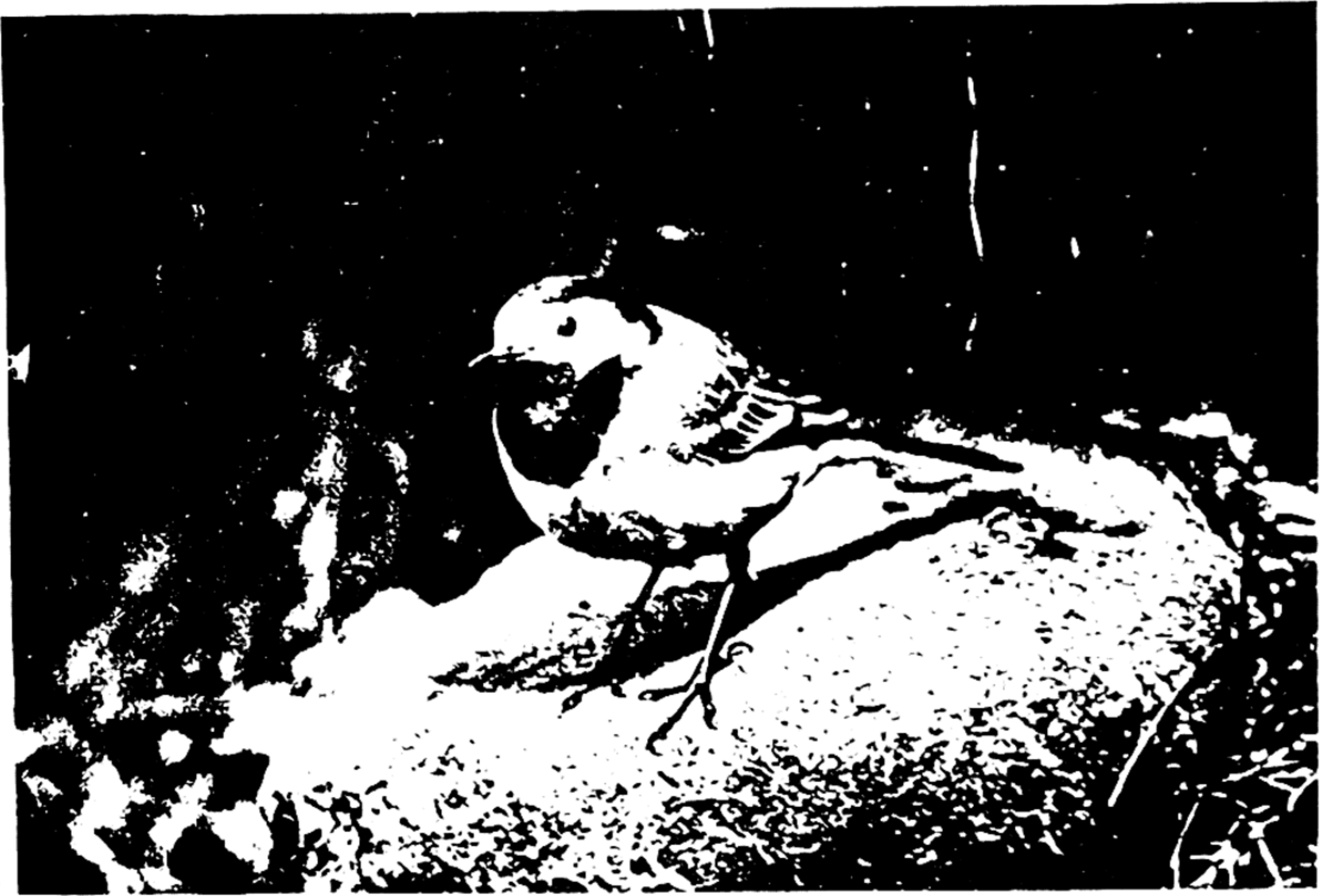
Enicuridae (*Fork-tails*). The Fork-tails include a few small birds with black and white plumage and long, forked tails. They frequent the mountain streams of tropical Asia from the Himalayas and China to the Malay Peninsula, Sumatra, Java and Borneo. They build large nests under a stone or fallen tree close to the water, and lay greenish-white eggs freckled with rusty brown. They are constantly in motion, flitting from rock to rock by the sides of the torrents.

Motacillidae (*Pipits, Wagtails, etc.*) This family comprises small birds with thin, slender bills ; wings with only nine primaries, and secondaries nearly as long as the primaries ; and long tails of twelve feathers. They are chiefly terrestrial in habits, running on the ground instead of hopping, and generally keeping the tail in constant up-and-down motion. Their nests are open and cup-shaped, either placed on the ground or in a hole in a bank or wall, and their eggs are spotted. They are represented in almost all parts of the world, but in North and South America, Australia and New Zealand only by Pipits, members of the genus *Anthus*.

Meadow Pipit (*Anthus pratensis*). This bird, often called the "Tit-lark," much resembles the Skylark in colouring, but is a smaller, more slender bird, without a crest, and its song and call-notes are very different. It is an inhabitant of Europe and western Asia, breeding in moorlands, mountain pastures and rough commons, and in winter visiting fields and wet places in the lowlands, or migrating south to the Mediterranean countries. Very similar species, frequenting similar habitats, are found in almost all parts of the world.

Rock Pipit (*Anthus petrosus*). This bird is slightly larger than the Meadow Pipit and its plumage is darker. It inhabits the coasts of north-western Europe, including the British Isles, in summer frequenting

PIPITS AND WAGTAILS



[A. H. Walford.]

PIED WAGTAIL (*Motacilla yarrelli*).

The long tail of the "Water Wagtail" is perpetually in up-and-down motion. The hen bird here seen is much lighter on the back than the cock.

cliffs and rocks, but in winter also visiting salt-marshes and muddy estuaries.

Tree Pipit (*Anthus trivialis*). This Pipit is almost identical with the Meadow Pipit in plumage, but has a short curved hind claw, whilst that of the Meadow Pipit is long and straight. Its name is derived from its habit of singing in or from a tree, but like its congeners, it feeds and nests on the ground.

Pied Wagtail (*Motacilla yarrelli*). This is a small black and white bird, with a long tail which is perpetually in motion. It is an inhabitant of the British Isles and western Europe, some wintering as far south as Morocco. It frequents lawns, meadows and river banks.

Grey Wagtail (*Motacilla cinerea*). This Wagtail is somewhat larger and with an even longer tail. In summer the male has the head and back blue-grey, the throat black and the underparts bright sulphur-yellow. The female is duller, and in winter both sexes have the throat white. In summer it is found throughout Europe and northern Asia in suitable localities, and many migrate south to winter in tropical Africa and Asia. It frequents almost exclusively the neighbourhood of rivers and streams in hilly or mountainous country, finding its food on the damp rocks by the water-side.

AVES (ORDER PASSERIFORMES)

Yellow Wagtail (*Motacilla flava*). This is a summer visitor to Europe, northern Asia and Alaska, wintering in tropical Africa and Asia. The upper parts are olive-brown tinged with yellow, the tail blackish-brown with white edges and the underparts bright yellow. The species includes a large number of races which differ chiefly in the colouring of the head of the male. In the race which breeds in England the forehead, crown and eyebrow of the male are bright yellow. The Yellow Wagtail frequents



meadows and pastures chiefly in the vicinity of water.

Alaudidae (*Larks*). This family includes terrestrial birds inhabiting open country—cultivated land, pasture or desert. They are numerous in Africa and Asia, few in Europe, and represented by only one or two species in North America and Australia. The claw of the hind toe is straight, sharp and often very long. Their bills vary greatly, in some species being fairly slender and pointed, in others very stout. Larks are mostly brown or sandy in colour, often being very inconspicuous when on the ground, where they run instead of hopping. Most of them rise into

[T. M. Fowler.
YELLOW WAGTAIL (*Motacilla flava*).

A summer visitor to England which breeds in water-meadows and hayfields near rivers.

the air to sing and the majority rarely or never settle in trees. Their nests are almost always open, cup-shaped structures on the ground, and their eggs have a whitish ground-colour, generally almost hidden by a profusion of spots and freckles of grey or brownish.

Skylark (*Alauda arvensis*). This is a brown bird, lighter below, and with white margins to the tail. The plumage is more or less streaked with darker colours, and the feathers of the top of the head are elongated, forming a low crest. It is one of the commonest birds throughout large parts of



[A. H. Welford.]

MEADOW PIPIT (*Anthus pratensis*)

Perhaps better known as the "Titlark," this dull coloured terrestrial bird is probably the most widespread species in the British Isles



[T. M. Fowler.]

TREE PIPITS (*Anthus trivialis*)

A summer visitor to the British Isles, the male sings either in a tree or in the air during his descent with wings and tail spread.

AVES (ORDER PASSERIFORMES)

Europe and Asia, those which breed in the more northerly portions migrating south in autumn. During the winter it is found in temperate Europe and Asia and south to India and North Africa. The song of the Skylark, uttered whilst it circles round in the air with rapidly-beating wings, sometimes so high as to be almost invisible, is remarkable more for its continuity and the rapidity with which the loud notes succeed one another, than for sweetness or variety of the notes, but it has inspired some of the finest poems in the English language.

Woodlark (*Lullula arborca*). This is similar to the Skylark in colouring but somewhat smaller, without a crest and with a very short tail. It is found throughout most of Europe, in western Asia and in north-western Africa, but in the British Isles is only found locally in the South of England. It does not inhabit woods, but prefers open country with plantations or scattered trees. Its song is sweeter than that of the Skylark, but less prolonged and may be uttered while the bird is flying or when perched in a tree.

Fringillidae (*Finches, Sparrows, Buntings, etc.*). This is a very large group of small birds, represented in all parts of the world. In Australia and New Zealand none is indigenous, but several European species have been acclimatized. Finches have conical, rather short beaks, with the nostrils close to the feathers and either partly concealed by them or by a membrane. There are only nine primaries in the wing; the tail-feathers number twelve. The sexes are almost always different, the young resembling the females. Almost all, except the Sparrows, build open, cup-shaped nests. The eggs vary in ground colour, but are nearly always spotted, speckled or streaked.

Members of this family are predominantly seed-eaters, but they feed their young largely on insects. Many have pleasing songs.

Hawfinch (*Coccothraustes coccothraustes*). This bird is remarkable for its very stout bill. Its plumage is mainly rufous-brown, with some black and white. It occurs throughout Europe and the greater part of Asia, but its shy habits lead to its being overlooked. Its great partiality for peas often leads to its destruction by gardeners.

Greenfinch (*Chloris chloris*). The Greenfinch has a stout bill and green plumage, with patches of yellow in the wings and tail. It is found throughout Europe, in north-western Africa and western Asia, being very common in the British Isles.

Cardinal (*Cardinalis cardinalis*). This bird occurs throughout eastern North America. The male is bright rosy-red, with some black on the face and a conspicuous crest; the female is dull red and brownish.

Crested Cardinal (*Paroaria cucullata*). This Cardinal is a native of Brazil, Uruguay and Argentina, and is a very common cage bird. The Crested Cardinal is grey above and white below, the head, crest, throat and breast being brilliant scarlet.

FINCHES (FRINGILLIDAE)

Goldfinch (*Carduelis carduelis*). This is one of the most brightly-coloured small birds found in the British Isles, and is a favourite cage-bird. It occurs also throughout Europe, in north-western Africa and western Asia. The face is crimson, the cheeks white and the back of the head and sides of the neck black; the back is amber-brown; the breast, white, with a buffish and yellowish band; the wings are black, barred with bright yellow, and the tail black, with white at base and tip.

Siskin (*Carduelis spinus*). This bird is found in summer from Scotland across northern Europe and Asia to the Pacific, breeding in pine woods.



[T. M. Fowler.

SKYLARK (*Alauda arvensis*).

It has been estimated that this is the most plentiful of all European birds.

and migrates southward for the winter, when it is not uncommon in England. Its plumage is predominantly greenish above and yellowish below, and the male has the crown and chin black.

Redpoll (*Carduelis flammca*). This is a small finch with brownish colouring, the feathers being more or less edged with white, and the breast and rump more or less red in the breeding season. The forehead is blood-red and the chin black. Various races of this species occur in high northern latitudes, breeding in birchwoods to the limit of their distribution in the Arctic, whilst the smallest race breeds in the British Isles and the mountain ranges of Europe.

Mountain Linnet or Twite (*Carduelis flavirostris*). This breeds in northern Europe and Asia on high moorlands or near the coast. In the British Isles

AVES (ORDER PASSERIFORMES)

it is found in Scotland, northern England and Ireland. In winter many migrate southwards. The plumage is mottled with various shades of brown and the male has the rump rose-red.

Linnet (*Carduelis cannabina*). In winter this is a comparatively dull bird, mottled with grey and brown, but in the breeding season the male has crimson on the head and breast and chestnut-brown mantle. It inhabits the greater part of Europe and south-western Asia, many migrating southward for the winter. In the British Isles it is a common bird at all seasons.

Chaffinch (*Fringilla coelebs*). The Chaffinch occurs throughout Europe, in north Africa and in western Asia. The male has a blue-grey head, reddish-brown back, yellowish-green rump and pink breast ; the wings are



[T. M. Fowler.]

GOLDFINCH (*Carduelis carduelis*).

This lovely finch commonly builds its nest in fruit trees. The one here seen is in a pear tree.

blackish, with two conspicuous white bars and the tail, blackish, with white edges. The female is yellowish-brown above and yellowish-grey below, with wings and tail like those of the male.

Brambling or Bramble-finch (*Fringilla montifringilla*). In summer this inhabits the sub-Arctic forests of northern Europe and Asia and has occasionally nested in Scotland. In winter it travels southwards in flocks, and in some seasons is plentiful in the British Isles, its winter range extending to North Africa, Asia Minor, northern India and Japan. The plumage is orange-brown with black markings, the rump and a bar on the wing are white. In the breeding season the male has a black head.

Bullfinch (*Pyrrhula pyrrhula*). This bird, found throughout Europe and northern Asia, has a short and very stout beak. The male has the top of the head black ; the back, blue-grey ; the rump, white ; and the cheeks

FINCHES (FRINGILLIDAE)



CROSSBILL (*Loxia curvirostra*).

The crossed mandibles of this finch help it to extract the seeds from fir-cones.

and breast bright red ; the wings and tail are black. In the female the back is brownish-grey and the breast, pinkish-brown, otherwise she resembles the male.

Crossbill (*Loxia curvirostra*). The Crossbill is an inhabitant of the pine - forests of Europe, northern Asia and North America, remarkable for the fact that the curved tips of the mandibles are crossed. The plumage

of the male is mostly dull crimson, with brown wings and tail ; the female is greenish-orange and the young, green with dark streaks. The birds climb about in trees like parrots, using the bill as well as the feet, and the bill also serves to extract the seeds from the cones of pine, spruce or larch. The Crossbill breeds very early, often in February, and the birds from northern Europe in some seasons travel south in flocks in the middle of summer, often appearing in numbers in the British Isles and south-western Europe.

In recent years some of these nomads have established breeding colonies in various localities in England and Ireland, but these tend to disappear after a few years, unless reinforced by another invasion from the north.

Serín Finch (*Serinus canarius*). This is a streaked greenish-brown bird, with yellow rump and breast. It is an inhabitant of central Europe and the countries round the Mediterranean, also of



Photos]

LINNET (*Carduelis cannabina*).

Variously known as the Grey, Red or Brown Linnet, according to its plumage, which changes with the season.

[T. M. Fowler.

AVES (ORDER PASSERIFORMES)

the Azores, Madeira and the Canary Islands. This species is undoubtedly the ancestor of the domesticated *Canary*, which from its name was presumably originally brought from the Canary Islands, though its origin is as obscure as that of most other domesticated animals. In confinement a considerable number of varieties have been produced, and variation began early, since in 1587 the canary-bird was described as almost wholly yellow. The different breeds vary in size, the Lancashire being much the largest; in form, the Scotch and Belgian fancy canaries and the crested canary are the most remarkable; in colour, the variation



(Stanley Crook.
SISKIN (*Carduelis spinus*).
Chiefly known in England as a winter visitor from the North, but breeding in pinewoods in Scotland.

is from a plumage resembling that of the wild Serin to pure yellow and to the colours of the Cinnamon and Lizard canaries; and there is also great difference in capacity for song, for which the Norwich, and particularly the German roller, canaries are the most celebrated.

House Sparrow (*Passer domesticus*). This bird is too well-known to require description. It is found throughout the greater part of Asia and most of Europe, but is everywhere more attached to human dwellings than any other bird, and nowhere thrives away from towns, villages and farms. It has been introduced into North and South America, South Africa, Australia and New Zealand and is steadily spreading over the settled districts of those countries, so that in time it will probably be almost as cosmopolitan as man. In Italy, however, it is replaced by the nearly allied Italian Sparrow (*Passer italiae*), and in parts of

Spain, Sicily and North Africa by the Spanish Sparrow (*Passer hispaniolensis*). The bulky, untidy, domed nests of Sparrows resemble those of Weaver-birds and are unlike those of the true Finches, and some authorities consider that the genus *Passer* should be placed in the family Ploceidae.

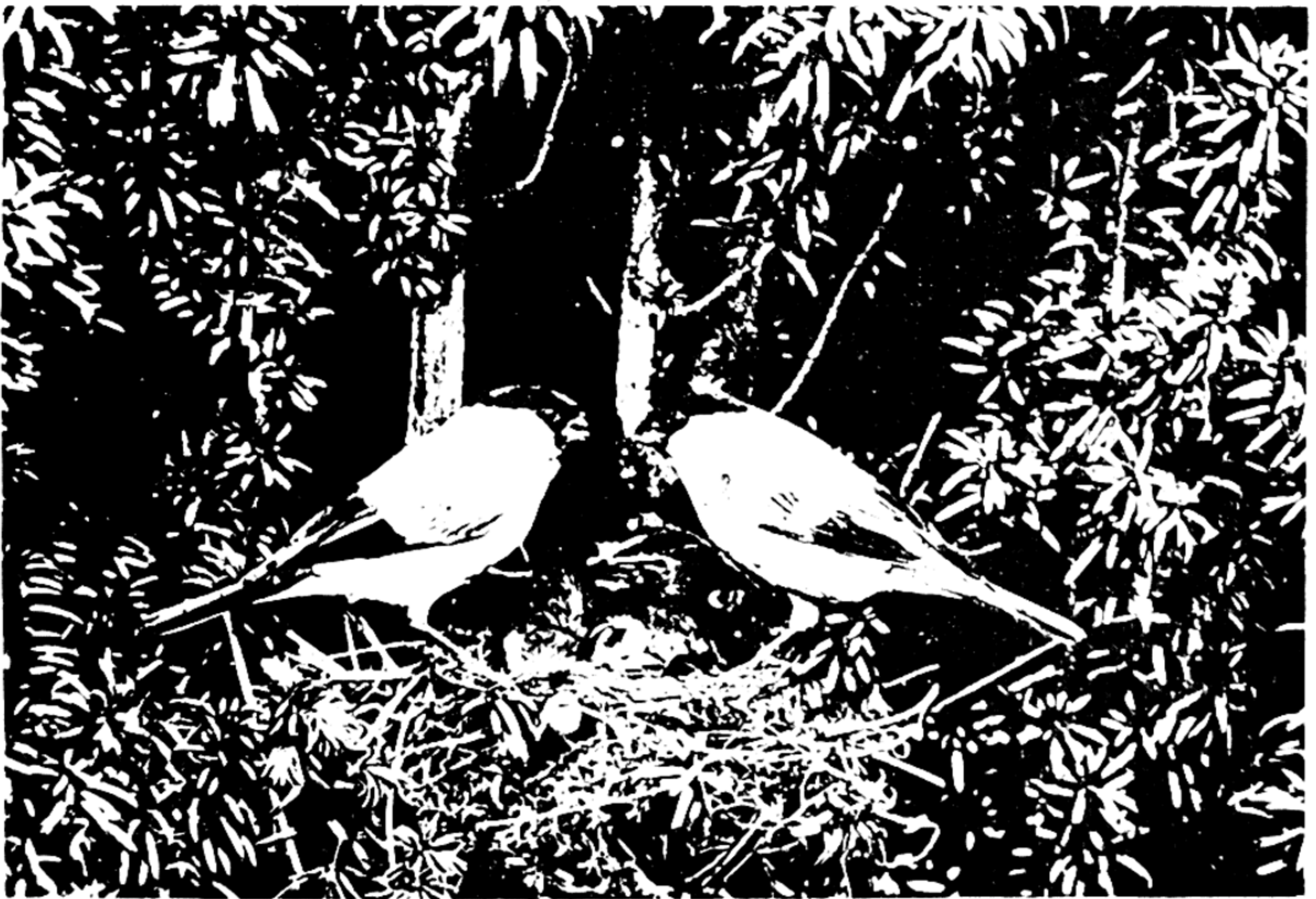
Tree Sparrow (*Passer montanus*). This differs from the House Sparrow in having the crown chestnut and a black spot on the cheek, and in the fact that the cock and hen are similar. In many parts of Eastern Asia it takes the place of the House Sparrow, and is familiar from its constant representation by Japanese artists, but in Europe, including the British Isles, it usually inhabits copses, hedges or trees on river-banks.

Common, or Corn, Bunting (*Emberiza calandra*). This is a heavily-built finch, whose plumage is mottled with various shades of brown. It is



[Reginald Gaze.]

YELLOWHAMMER (*Emberiza citrinella*).
The female here seen on her nest, lacks the bright yellow head of her mate.



[Ian H. Thomson.]

BULLFINCH (*Pyrrhula pyrrhula*).

AVES (ORDER PASSERIFORMES)



[Oliver G. Pike.

CHAFFINCH (*Fringilla coelebs*).

The commonest finch in the British Isles and the builder of a wonderfully neat nest of moss, lichen and wool.

common in the British Isles and in many parts of Europe, western Asia, and northern Africa.

Yellow Bunting or **Yellowhammer** (*Emberiza citrinella*). This has the head and underparts lemon-yellow, the rump chestnut and the remaining plumage mottled brown. It is very common in almost all parts of the British Isles, frequenting hedgerows and furzy commons, and its range extends through central and eastern Europe to Siberia.

Cirl Bunting (*Emberiza cirlus*). This bird has a more southerly range than the Yellowhammer,

extending from South Wales and western and southern England through the countries on both sides of the Mediterranean to southern Russia and Asia Minor. The male has a black throat, yellow collar, greenish band across the breast, yellow belly and chestnut flanks. The rest of his plumage is mottled with various shades of brown, whilst that of the female is almost entirely of this colour.

Reed Bunting (*Emberiza schoeniclus*). This is an inhabitant of reed-beds and bushes growing in marshy localities throughout Europe and northern Asia, many migrating to Africa and India in winter. The male in breeding plumage has the head and throat black, a broad, white collar, the upper parts mottled with reddish-brown and dark brown, and the underparts whitish. The female, and the male in winter, has the plumage

BUNTINGS (FRINGILLIDAE)

mottled with various shades of brown. Both sexes have conspicuous white patches on the outer tail-feathers.

Snow Bunting (*Plectrophenax nivalis*). This breeds in the Arctic and sub-Arctic regions of both hemispheres, a few nesting near the summits of mountains in the Highlands of Scotland. In winter large numbers travel south to the British Isles, Central Europe, Asia and the United States, frequenting high ground or the neighbourhood of the coast. In breeding plumage the male is white with black on the back, wings and tail, but in winter his upper parts are mainly chestnut with large patches of white in the wing. The female has the upper parts greyish-black, the underparts and secondaries being white.

Catamblyrhynchidae. This family includes only the Plush-capped Finch (*Catamblyrhynchus diadema*), found in the Andes, from Colombia to Peru. It is a finch-like bird, but with a stout, very much flattened, broad bill, and the plumage of its forehead and crown is dense, erect and plush-like.

Coerebidae (*Quit-quits* or *American Creepers* and *Sugar-birds*). This family includes a number of small birds allied to the Tanagers, inhabiting tropical America



[G. K. Yeates.

REED BUNTING (*Emberiza schoeniclus*).
The female is here seen on a hot day shading her young with outspread wings.

AVES (ORDER PASSERIFORMES)



By courtesy of]

[the American Museum of Natural History.

SCARLET TANAGERS (*Piranga erythromelas*).

and the West Indies, many of them brilliantly coloured. Their bills are conical or slender and they have a long extensible bifid tongue, frayed at the end. They climb about in the trees, somewhat like Tits, and extract honey from flowers, and catch insects. They build domed nests of grass, moss and fibres, and lay from two to four eggs, white or greenish-blue, with brown or reddish spots.

Procnitidae. This family contains a single species, *Procnias viridis*, found throughout the forested regions of tropical South America. It has a very wide bill, and lays white eggs in a hole, in a tree or in the ground, lined with roots and stems.

Thraupidae (Tanagers). The Tanagers include a large number of finch-like birds, chiefly found in tropical America, a few extending to the United States and Canada in the north and Argentina in the south. Their bills are conical and pointed, and the nostrils are exposed. Most of the species have brilliant plumage and the sexes are frequently differently coloured. They are chiefly forest-frequenting birds, wandering through the jungles in small parties, feeding on berries, flowers and insects.

Scarlet Tanager (*Piranga erythromelas*). This is a summer visitor to eastern North America, wintering in the tropics. The females and young birds, and the adult males in winter, are greenish above and yellowish below, with dark wings and tail, but the adult male in summer is bright scarlet, with black wings and tail. The nest is a rather slight structure of

TANAGERS, WEAVER-BIRDS, WIDOW-BIRDS

fine twigs and weed stalks, usually placed near the end of a branch, and the three or four eggs are bluish, with numerous reddish-brown markings.

Ploceidae (*Weaver-birds*). The Weaver-birds include a large number of small birds, nearly allied to the Finches, with similar conical bills, but with the first primary developed, though usually small. They are most plentiful in Africa, but occur also in tropical Asia, the Malay Archipelago, Australia and some of the Pacific Islands. The males usually have brilliant plumage, often with strikingly contrasted patches of colour, whilst the females are generally plainer. Almost all the species build large, untidy nests of grasses more or less woven together, domed and sometimes with a projecting tubular entrance. The nests are often close together in colonies. Most species lay white eggs, but in some they are blue or green, and in some they are also speckled or spotted.

Java Sparrow (*Munia orizivora*). This bird is indigenous in Java, Sumatra and Malacca, but has been naturalized elsewhere and is one of the best-known cage-birds. It has a slate-grey body and black crown and usually also white patches on the cheeks. The bill is pink. A white variety is also commonly kept in cages. The sexes are alike. In the wild state it is often very injurious to crops of rice or other grain.

Long-tailed Widow-bird (*Chera progne*). This bird, also called Whydah, is an inhabitant of eastern South Africa, where it inhabits swampy ground and reed-beds. The female is a mottled brown bird with an orange patch on the shoulders, but the male is glossy black, with the shoulder-patch buff and crimson. In the breeding season



(M. H. Crawford.
REDPOLL (*Carduelis flammea*).
The smallest of the British finches feeds largely on the seeds of the alder during the winter.

AVES (ORDER PASSERIFORMES)

the tail-feathers of the male are enormously elongated, becoming about twice the length of the body, and the bird can only fly with some difficulty. In wet weather or against a strong wind it cannot fly at all. The nest is built among long grass on the ground.

Sociable Weaver (*Philaeterus socius*). This Weaver, of South Africa north of the Orange River, constructs an umbrella-shaped mass of sticks and straw among the branches of a tree, in the flat under-surface of which holes are constructed for nests. Sometimes as many as three hundred pairs breed together in one of these structures. The birds are among the dullest members of the family, being brown, buff, black and white.

Icteridae (*Troupials, Hang-nests, American Orioles, Meadow-larks, Grackles and Cowbirds*). This family includes over one hundred and fifty



By courtesy of]

[the American Museum of Natural History.
PURPLE GRACKLE.

species distributed throughout America, very various in colouring and occupying very diverse habitats—forests, prairies and swamps. They have long, pointed bills and the upper mandible extends backwards to a greater or less extent, dividing the feathers of the forehead. The nostrils are free

and there are no bristles at the base of the bill. The first primary is as long as the second and third.

Baltimore Oriole (*Icterus galbula*). This bird is found in summer throughout eastern North America, wintering in Central America. The male is largely rich reddish-orange in colour, with a black head, throat, upper back and wings, and a black band across the tail. In the female the orange colouring is much duller and the black markings are replaced by brownish. The nest is a pensile structure, woven of soft materials, entirely by the female, and the eggs are white, curiously scrawled with dark lines. This species frequents woods and orchards.

Meadow-lark (*Sturnella magna*). This is a terrestrial bird inhabiting grassy fields and swamps throughout eastern North America. In this species the sexes are similar, the upper parts mainly black and the under-parts largely bright yellow, with a black crescent on the breast. The nest

HANG-NESTS AND ORIOLES

is built of grasses, on the ground, and the eggs are white, speckled or spotted with rufous.

Grackle (*Quiscalus quiscula*). The Grackle is also called the Crow-Blackbird, and is a black bird with brilliant purple, green or steel-blue gloss on the feathers and a rather long, rounded tail. Found in the eastern United States, it is sociable in habits, breeding in colonies, and placing its bulky, compact nest of mud and coarse grasses, generally at some height, in coniferous trees.

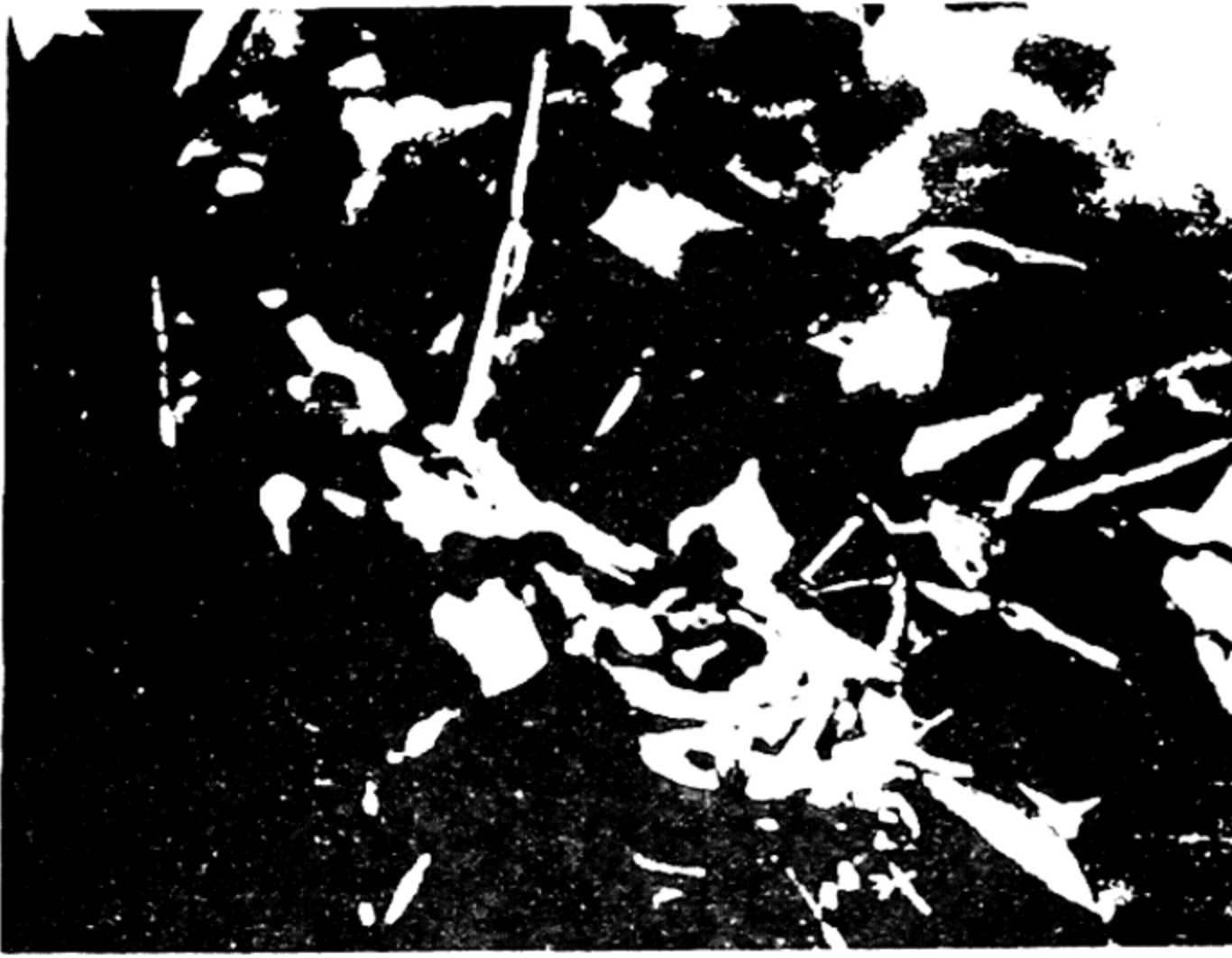
Black Cowbird (*Molothrus ater*). This bird is found throughout North America and lives a nomadic life, wandering about in small parties. The males are chiefly glossy black, with metallic reflections, the head and breast being coffee-brown. The females are dark brownish-grey above, lighter below. They lay their eggs in the nests of smaller birds, and the young, when hatched, grow faster than the rightful occupants, obtaining most of the food brought by their foster parents. The other young birds are thus crowded out or starved and the young Cowbird remains alone, continuing to be fed by the fosterers for some time after it has left the nest.

Oriolidae (*Orioles*). The Orioles are medium-sized birds, with ten primaries, of which the first is well-developed, being about half the length of the second, and twelve tail-feathers. The bill is fairly long and straight, with fine, short bristles at the base, and the nostrils are partially covered by a membrane. Orioles are found in tropical Africa, Asia, the Malay Archipelago and Australia, one species visiting Europe in summer. The



By courtesy of [the American Museum of Natural History.
MEADOW-LARK (*Sturnella magna*).

AVES (ORDER PASSERIFORMES)



GOLDEN ORIOLE (*Oriolus oriolus*).
[Major Buxton.]

birds called " Orioles " in America belong to the family *Icteridae*. Orioles build hammock-like nests of soft material suspended by their edges from two or more forking twigs. They lay white or pinkish eggs (from three to five), with purplish or brown spots or streaks. The sexes are differently coloured, the males usually being largely yellow and the females greenish, while the young have striped breasts.

Golden Oriole (*Oriolus oriolus*). This is the species already mentioned as a summer visitor to Europe. Its range includes southern England, where it would probably breed regularly if the brilliantly-plumaged males were not almost always shot on their arrival. They are chiefly golden-yellow, with black on the face, wings and tail ; the bill is dark pink ; the eye crimson, and the legs and feet slaty-black.

Buphagidae (*Ox-peckers*). The Ox-peckers include only two species of starling-like birds, found in small flocks throughout Africa. They are greyish-brown in colour and live almost exclusively on the bots, ticks and other external parasites of cattle and other large animals. In search of their food they climb over the bodies of the animals in almost the same way as do woodpeckers on trees.

Graculidae (*Glossy Starlings*). This family includes birds closely related to the Starlings, but having bristles round the base of the bill, and laying spotted eggs. They are found in tropical and southern Africa, tropical Asia, the Malay Archipelago and the Pacific Islands, one species visiting northern Australia in summer.

Sturnidae (*Starlings*). The Starlings constitute a small group of birds found in Europe, Asia and Africa. They have fairly long, nearly straight bills, with exposed nostrils, and no bristles at the base. There are ten primaries in the wing ; but the first is very small. They breed in holes and lay unspotted eggs, and the young birds differ in plumage from the adults.

Common Starling (*Sturnus vulgaris*). This bird occurs naturally throughout Europe, north Africa and the greater part of Asia, and has been introduced into North America and Australia, in both of which continents its increase and spread have been rapid. The plumage in both sexes is blackish with metallic reflexions, the tips of the feathers are buffish

STARLINGS AND DRONGOS

or whitish in winter, giving the birds a spotted appearance, but these tips wear off, so that in summer the birds are darker and more glossy. The eggs are very pale blue. Starlings are sociable birds and in winter they congregate to roost in reed-beds, shrubberies or plantations in immense swarms.

Rose-coloured Starling (*Pastor roseus*). This Starling has the body rosy pink, the head and neck, wings and tail being glossy black. It has a large black crest. It inhabits south-east Europe and western Asia, commonly visiting India in winter and frequently also wandering westward, sometimes reaching the British Isles. It breeds in large colonies in holes in rocky ground, in a very erratic fashion, selecting regions where locusts or grasshoppers are specially abundant. Its eggs are very pale bluish-white.

Dicruridae (Drongos). This family contains representatives in Africa, tropical Asia and the Malay Archipelago east to the Solomon Islands.

One species is a summer visitor to Australia. Drongos are mostly black in both sexes, the feathers usually having a metallic sheen. They mostly have a stout bill with a hooked tip; long wings; long, forked tails of only ten feathers; short legs, and small feet. They are insectivorous birds, capturing part of their food on the wing; they are noisy and pugnacious, driving away much larger birds from the vicinity of their nests. The best-known species is the King-crow (*Buchanga atra*), of India, Burma and Indo-China.



[Charles Reid.

STARLINGS (*Sturnus vulgaris*).
Probably the most abundant bird in the British Isles, especially in winter, when large numbers which breed on the Continent are present.

AVES (ORDER PASSERIFORMES)



[E. N. A.]

BOWER, OR COVERED RUN, OF AN AUSTRALIAN SATIN BOWER-BIRD.

Built of twigs and stiff grass and arranged to form a kind of tunnel among the bushes. It is used as a sort of playground and adorned with flowers and feathers, usually blue in the case of this species.

Ptilonorhynchidae (*Bower-birds*). The Bower-birds are very closely related to the birds of paradise, but their bills are usually stouter and shorter, and though the males of many species are brilliantly coloured, they do not develop specially-modified plumes. They obtain their name from their habit of constructing structures of various kinds, composed of sticks, round which they collect brightly-coloured objects, and in and about which they spend a great deal of time arranging their treasures, courting and playing. These structures, built by the males on the ground, and generally called bowers, are quite distinct from the nests,

which are of the ordinary cup-shaped form, and are built in trees and bushes. The family contains about twelve species, found in Australia and New Guinea.

Green Cat-bird (*Ailuroedus crassirostris*). This bird, of eastern New South Wales and south-eastern Queensland, obtains its name from its extraordinary cat-like notes. It is exceptional in not making any sort of bower. It lays plain, cream-coloured eggs.

Satin-bird (*Ptilonorhynchus violaceus*). The Satin-bird inhabits coastal forests throughout eastern Australia. The adult male is entirely blue-black in colour, with bright blue eyes. He constructs a platform of sticks, towards the centre of which two parallel rows of sticks are fixed vertically, to form a short passage with a stick-hedge on each side. On the platform he collects flowers, either blue or pale yellow in colour, yellowish leaves, snail-shells and blue feathers, together with any other blue objects he can find, such as blue-bags, bits of blue paper or blue china.

Spotted Bower-bird (*Chlamydera maculata*). This bird inhabits the inland regions of eastern Australia, and constructs a bower very similar to that of the satin-bird, but with a longer passage. Both sexes are brownish, spotted with yellowish-white, and have a patch of pink feathers on the back of the neck, larger in the male. This species ornaments its bower with green berries, white bones and anything shining that it can find, such as bits of metal or broken glass. The eggs are pale green, covered with brown and black scrawled lines.

Gardener-bird (*Amblyornis inornata*). The Gardener-bird of New Guinea builds a bower round a sapling in the form of a hut, and in front of the entrance spreads a lawn of moss, on which he arrays bright flowers, berries and beetles. In this species both sexes are olive-brown above,

BOWER-BIRDS AND BIRDS OF PARADISE

paler below, but the male is distinguished by a bushy crest of soft, orange-yellow feathers.

Paradiseidae (*Birds of Paradise*). This family includes birds akin to the Crows, but with the nostrils either free or partially covered by scale-like feathers, not by bristles. The adult males usually differ greatly from the females, and young birds of both sexes resemble the latter. In the brilliance of their plumage the adult males of this family are equalled only by the humming-birds, and in no other group of birds is there such a development of plumes and modified feathers of extraordinary length and form.

Birds of Paradise are found mainly in the jungles of New Guinea, a few species occurring in the Molucca and Aru Islands, and along the east coast of Australia south to New South Wales. They feed on jungle fruits and insects, but comparatively little is known as to their nests and eggs. In some species the males assemble and indulge in dances on the trees, displaying their marvellous feather ornaments. About seventy species are known, a considerable number of them only from one or two specimens, and there is little doubt that future exploration in New Guinea will discover additional forms.

Great Bird of Paradise (*Paradisea apoda*). This bird inhabits the Aru Islands and southern New Guinea. The adult male is rich brown above and purplish below; the head and neck are pale yellow and the face and throat metallic green, and from the sides spring tufts of long, soft, golden-orange feathers tipped with brown. The female is entirely reddish-brown, darker on the head and lighter below.

Red Bird of Paradise (*Paradisea rubra*). This bird is somewhat similar to the bird described above in its plumage, but the tufts of plumes on the sides of the male are deep red. It inhabits Waigeu, Batanta and Gemien islands off the west end of New Guinea.

King Bird of Paradise (*Cicinnurus regius*). This is one of the smallest



(James's Press.

MYNAH (*Acridotheres tristis*).

An Indian member of the Starling family, which frequently learns to talk when kept in captivity.

AVES (ORDER PASSERIFORMES)



[James's Press.
LESSER BIRD OF PARADISE (*Paradisea minor*).
The male of this species has brown plumage, yellow head and neck and the long ornamental plumes of a straw-yellow colour.

species, only about seven inches long, but one of the most remarkable. The male is glossy crimson above and white below, with a metallic green band on the fore-neck. On each side it has a tuft of grey plumes, tipped with green, which it can expand into fans. The shafts of the two central tail-feathers extend as stiff curved "wires" some inches beyond the other tail-feathers, and end in spirally-coiled green discs. The bill is orange, and the legs and feet are cobalt-blue. This is, perhaps, the most widely distributed species, being found throughout New Guinea, in Salawati, Jobi and Misol, and in the Aru Islands.

Paradise Rifle-bird (*Ptiloris paradisea*). This bird, of southern Queensland and Northern New South Wales, is the only member of the family found outside the tropics. The male has black plumage,

which in different lights appears rich purple, steel-blue, or coppery-green; on his throat he has a patch of brilliant metallic feathers, burnished green and purple. The female is brown above and buff below, mottled and barred with black. This is one of the few Birds of Paradise whose breeding habits are known. The nest is a rather slight, open cup, built in a tangle of creepers; it is chiefly remarkable for the fact that the cast skin of a snake is almost always twined round the outside. The eggs are flesh-coloured, boldly streaked longitudinally with reddish and purplish-brown.

Creadiontidae (Saddlebacks). This family contains only two species of arboreal birds, found in New Zealand. They have long, sharp-pointed

BIRDS OF PARADISE AND SADDLEBACKS

bills ; rather short, rounded wings ; fairly long tails ; long, strong legs ; and a long claw on the hind toe. The general colour of the plumage is black and a fleshy, orange-coloured wattle depends from the gape on each side. *Their nests are placed in hollow trees.

Saddleback (*Creadion carunculatus*). This bird was formerly common in the forests of both islands of New Zealand, but is now very scarce except on a few islets off the coasts. The sexes are alike and their black plumage is relieved by bright chestnut colouring on the back, wing-coverts and tail-coverts, forming a saddle-shaped patch. It is about the size of a Blackbird.

Huia (*Heterolocha acutirostris*). The Huia formerly inhabited the forests on some of the mountain ranges in the North Island of New Zealand, but is now probably extinct. It was as large as a crow, and its plumage was black, glossed with green, with a broad white band across the tip of the tail. It differed from all other birds in having the bill differently shaped in the two sexes. In both it was ivory-white, but while in the male it was stout and nearly straight, in the female it was much longer, more slender and strongly curved. The food consisted of fruits, spiders and insects, particularly the larvae of insects which bore into wood. To obtain these the male used his stout bill to chisel away soft wood or tear off the bark, whilst the female inserted her flexible bill into holes in wood too solid for the male to attack.

Callaeidae (*Wattled Crows*). This family includes two species inhabiting respectively the North and South



(W. S. Burdige.
KING BIRD OF PARADISE (*Cicinnurus regius*).
A small species with orange bill, cobalt feet, plumage crimson and white, with green throat and ornamental feathers in wings and tail.

AVES (ORDER PASSERIFORMES)

Islands of New Zealand, and a third found in eastern Australia. They have short, stout, strongly-arched, blunt bills; short, rounded wings; and rather long tails. Their plumage is mainly dark grey, with blackish wings and tail. The species found in New Zealand have fleshy wattles on the gape, orange in colour in the South Island form, bright blue in that of the North Island. They associate in small parties, and progress largely by hopping about on the ground or among the branches of trees, a habit which has given the Australian bird the familiar name of Grey Jumper. The nest is a large, bowl-shaped structure, built in a tree; those of the New Zealand species being of sticks and moss, that of the Australian species, of mud. The eggs are greyish, with purplish and brownish spots; it is known that in the Australian species several females lay in the same nest.

Corvidae (*Crows, Magpies, Jays, etc.*). This family includes the largest "perching-birds." They have fairly long, but powerful, bills and their nostrils are covered by bristles directed forwards. There are ten distinct



(Arthur Brook.

RAVEN (*Corvus corax*).

This largest member of the Crow family still holds its own in most of the wilder parts of the British Isles.

CROWS, RAVEN (CORVIDAE)



[Arthur Brook.]

CARRION CROW (*Corvus corone*).

Smaller than the Raven and distinguished from the Rook by its stouter bill with feathered base, this Crow is widespread in England and southern Scotland.

primaries, of which the first is always much shorter than the second. The young birds in their first plumage resemble the adults.

Members of this family are found in almost all parts of the world. Species of the genus *Corvus* (Crows) are absent only from South America, and from most of the Pacific Islands. Birds allied to Jays represent the family throughout South America.

Crows and their allies are probably the most intelligent of birds. Their omnivorous food-habits bring them at times into conflict with farmers and fruit-growers, but they are mostly wary enough to hold their own, and in many countries are among the commonest of birds. Their nests are usually stout, cup-shaped structures of sticks, strengthened with earth and lined with fine twigs, rootlets, etc. Many species usually place them in trees, others generally in holes, or on ledges of cliffs. The eggs are usually from three to six in number, greenish or bluish in colour, with dark spots or mottlings.

Raven (*Corvus corax*). The Raven is the largest of all "perching-birds," and is entirely black, and has a very stout bill. It is found in Europe, north Africa, northern Asia and North America, chiefly in the wilder regions. Its occasional attacks on lambs or sick animals have led to its extirpation in most farming districts of Europe and North America.

AVES (ORDER PASSERIFORMES)



[L. J. Langford.]

ROOK (*Corvus frugilegus*).

Noteworthy from its gregarious habits and usually nesting in trees in towns or adjacent to buildings.

Its deep, hoarse croak is very characteristic, and its intelligence makes it an amusing bird in confinement; and it is one of the birds capable of learning to imitate human speech.

Carrion Crow (*Corvus corone*). Like the Raven, this Crow is entirely black, but is decidedly smaller, and has a less massive beak; it is found in western Europe, including England and southern Scotland, and in North-eastern Asia.

Hooded Crow (*Corvus cornix*). This bird has a grey body, with black head, wings and tail. It inhabits Ireland, northern Scotland, northern and eastern Europe, the countries round the Mediterranean, and south-western Asia. It is a common visitor in winter to eastern England and parts of western Europe. It differs from the Carrion Crow only in colour, and where their breeding ranges adjoin or overlap, the two species frequently interbreed, so that some authorities regard these two kinds of Crow as merely colour phases of one species.

American Crow (*Corvus brachyrhynchos*). This Crow closely resembles the Carrion Crow, but is more sociable in habits, and during winter very large flocks congregate to roost together. Very similar entirely black crows occur also in Asia and Australia.

Rook (*Corvus frugilegus*). The Rook of northern Europe and Asia,

ROOK, JACKDAW, CHOUGH

also has entirely black plumage, but its bill is more pointed, and in the adult bird the area of the face round the base of the bill is devoid of feathers, the naked skin being white. Rooks are sociable at all seasons of the year, breeding together in rookeries, many nests being built in close proximity in the same tree, and often also in many adjacent trees.

Jackdaw (*Corvus monedula*). The Jackdaw is smaller than the Rook, with which it commonly associates, and has a shorter bill, and a patch of grey on the nape. It is common in the British Isles, occurring also in various parts of Europe, north Africa and western and northern Asia. It breeds in holes in trees, cliffs, or buildings.

Nutcracker (*Nucifraga caryocatactes*). This bird has chocolate-brown plumage, with white spots. It inhabits coniferous forests in northern Europe and Asia, and the principal mountain ranges of the two continents. It appears occasionally in the British Isles.

Cornish Chough (*Pyrrhocorax pyrrhocorax*). The Chough is about the size of the Jackdaw, with black plumage, red legs, and a long, slender, curved, bright red bill. It inhabits the mountain ranges of Europe and northern Asia, and is also found in some localities on sea-cliffs, including those of Ireland, Wales and south-western England.



(Reginald Gate.

JAY (*Garrulus glandarius*).

Though noisy at other times, the Jay is very silent when nesting and thus manages to elude the gamekeeper.

AVES (ORDER PASSERIFORMES)

Alpine Chough (*Pyrrhocorax graculus*). This bird inhabits the chief mountain ranges of central and southern Europe, and of western Asia, east to the Himalayas. Like its congener, it is black with red legs, but its bill is shorter and bright yellow.

Magpie (*Pica pica*). The Magpie occurs in Europe, north Africa, northern Asia, and western North America. It has a very long, rounded tail and black and white plumage, the black portions having a beautiful gloss of metallic green, blue or purple. It covers its nest with a dome of sticks, nearly always thorny, leaving a comparatively small opening at one side, and lays from five or six to eight or even ten eggs.

Jay (*Garrulus glandarius*). The Jay has rufous-brown body plumage, with a white rump, and a black tail. The elongated black and white feathers of the crown form an erectile crest. The wing quills are black with a patch of white, and the wing-coverts are barred with black, white and light blue. The Jay occurs in Europe, north-west Africa and northern Asia, chiefly in well-wooded regions.

Blue Jay (*Cyanocitta cristata*). This Jay, of eastern North America, has most of the plumage of the upperparts greyish-blue, the underparts whitish. Its forehead and a band extending from the back of the head down the sides of the neck and across the breast are black, and the wing-quills are broadly tipped with white. Its head is crested.



[Stanley Crouk.]

YOUNG MAGPIES (*Pica pica*).

The long tail, so characteristic of the adult bird, is not developed when the young first leave the nest.

MAMMALIA
BY
R. I. Pocock, F.R.S.

INTRODUCTION

The Mammals or Mammalia, a name derived from the presence in the female of milk-glands for the nourishment of the young, constitute a well-defined class distinguished from the Reptiles, its ancestral stock, not only in the possession of these glands, but in their hairy covering and warm blood, this last character being shared by Birds. There are many other differences connected with the skull and the anatomy of the soft parts, but these need not be considered.

The range of structural variation within the class is greater than in any other class of vertebrated animals, except perhaps the Fishes ; and by these variations the Mammals are classified into a large number of subsidiary groups, called Orders. Some of these, like the whales, bats and elephants are isolated, and easy to define owing to the total extinction of their ancestral forms. Their descent can be inferred only from their structure and development, and from a study of the extinct fossil species which preceded them in time. But many of the Orders are difficult to define owing to the survival of primitive species ; and the primitive species tend to converge to a common type pointing to the characters and habits of the immediate ancestor of the class. A comprehensive survey of all the Orders, backed by the knowledge of their remote reptilian descent, helps us to picture what this ancestor was like.

It was a comparatively small, hairy, long-tailed quadruped with five nearly equal, sharp-clawed toes on the feet and with the brain and sense-organs better developed than in reptiles. The keener auditory sense, due in a measure to the more elaborate structure of the inner ear, was augmented by the presence of an external ear (*the pinna*), subservient to catching and guiding sound-waves. The sense of smell was increased by the development in the nasal passages of scrolls of delicate bone (*the turbinals*), over which the ends of the olfactory nerves were spread, and of an area of naked, moist skin round the nostrils, which was sensitive to wind and changes of temperature. Delicate organs of touch took the form of tufts of long bristles on the muzzle, cheeks and eye-brows, and of sensitive, naked pads on the tips of the toes and the soles of the feet. The mouth was provided with fleshy lips, a well-developed tongue and numerous teeth.

This hypothetical little creature could run, leap, climb, burrow and swim. Its diet consisted mainly of insects and other small animals ; but although the female retained the reptilian habit of laying eggs, it hatched them, as a bird does, by the heat of its body, suckling them thereafter by means of

MAMMALIA

its milk-glands, opening on the ventral surface, possibly in a pouch, and probably using a crevice or burrow as a nursery.

Comparison of this type with the higher, or as they are generally called more specialized, types of mammals shows how profoundly they have deviated from it in most respects in the course of their evolution in adaptation to a great variety of environments and modes of life.

The hair may be turned into spines or horny plates, or entirely lost. The tail may be adapted for swimming, prehension and other purposes or may disappear. In the head the eyes, the external ear and the tactile bristles may be enlarged, reduced or obliterated. But the organs most affected are the limbs and mouth, which are subservient respectively to two of the most important activities of life, namely locomotion, upon which the finding of food, escape from enemies and capture of prey largely depend, and feeding, which involves the picking up of food and dealing with it by mastication or otherwise before it is swallowed. And since the modifications of the limbs and mouth are more useful for the classification of mammals than those of other organs, it is necessary to give a few details regarding them to explain the meaning of some of the technical terms unavoidable in a treatise of this kind.

Since the limbs of man are familiar and in many respects primitive, they may be selected for description. The fore-limb or arm consists of an upper single long bone, the *humerus*, jointed above to the shoulder blade and below to the lower arm, which is composed of two long bones, the *radius* and the *ulna*. The wrist, or *carpus*, consists of several small bones to which the hand or *manus* is jointed. The hand, excluding the fingers, is made up of five longish bones, the *metacarpals*. To these the fingers or digits are jointed. The thumb, known technically as the first digit or *pollex*, consists of two bones or *phalanges*, the remaining four of three phalanges, the nails being supported by the terminal *phalanx*.

The hind limb or leg is like the arm in its main bones, but they are differently named. The thigh bone is the *femur*, the shin bones the *tibia* and *fibula*, the ankle is the *tarsus*, and the foot, without the toes, is composed of five *metatarsals*, the first digit, the 'great toe' in man, being called the *hallux*.

Apart from certain minor differences connected with the *hallux* and *pollex*, the conversion of the claws into nails and the loss of the pads, the limbs of man resemble in essentials those of our hypothetical mammalian ancestor.

When standing upright, man plants the entire sole of the foot on the ground. Apes and bears, when they assume that attitude, do the same. They are called *plantigrade*. But most mammals, generally in the interests of speed and spring, have the feet, especially the hind feet, lengthened, with the wrist and ankle raised off the ground so that they walk on their digits, the pads beneath forming a cushion for support. They are known as

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digitigrade, dogs and cats being typical examples. But even the rhinoceros and elephant are digitigrade, the elephant being an instance of a short-footed, slow-moving beast with this type of gait. The extreme modification of the digitigrade type is seen in those mammals, like sheep, which walk on hoofs encasing the enlarged terminal bone of the digits. They are *unguligrade*. In digitigrade and unguligrade mammals there is a marked tendency for the middle digits to monopolize the function of support at the expense of the others, which dwindle in size or disappear, four digits being retained in the pig, two in the giraffe and only one in the horse.



[James's Press.]

TRICERATOPS: A PREHISTORIC MONSTER.

There are many other modifications of the feet. In the swimmers, like the otter and beaver, the digits of the hind feet are lengthened and webbed. In diggers, the fore-feet are usually widened and are always armed with large claws, as in the mole. Only one other point requires notice here. The hind-limbs throughout the mammals are much more variable than the fore-limbs. Being the principal organs of locomotion, they are usually larger and more specialized; but all visible trace of them may be lost, as in the whales. The fore-limbs, on the contrary, never disappear; they reach their maximum of development in the wings of bats.

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The teeth, called collectively the dentition, are also very important organs for the classification of mammals, since they vary almost infinitely with diet. Usually they differ in shape and function in accordance with their position in the mouth. The teeth of the dog, which are well-known and tolerably primitive, will serve for illustration. In the upper jaw on each side there are three small front teeth, the incisors, lodged in a small bone, the *premaxilla*. Behind these is a long tooth, the *canine*, which is the first tooth of the series in the main bone of the jaw, the *maxilla*, the rest, six in number and extending to the back of the mouth, are the cheek-teeth. These are divided into two categories. The first four are distinguished by having, like the canines and incisors, what are called milk predecessors. They are known as *premolars*. The last two, which have no predecessors and are absent in young puppies, are the *molars*. A similar set of teeth is found in the lower jaw, except that there is one additional molar. But the dog has lost one upper molar. If this were present, the animal would have possessed what is usually assumed to be the numerically typical mammalian dentition represented by the formula $i, \frac{3}{3} c, \frac{1}{1} pm, \frac{4}{4} m, \frac{3}{3}$ making a total of forty-four teeth in all.

Although two sets of teeth, varying in shape and function are usual in mammals, the full complement is seldom retained. Occasionally, however, it is exceeded, very considerably indeed in some of the whales, which are also unusual in having the teeth of one set only and all alike.

The adaptations of teeth to diet are very remarkable. Normal teeth, like those of the dog, are composed of hard, bony dentine, the crown being covered with still harder enamel, and they are lodged in the jaw by one or more roots which are closed at the bottom when the tooth is complete so that it never grows subsequently. Cheek-teeth of this kind, with simple cusped or tubercular crowns, are characteristic of most carnivorous and insectivorous mammals. But the cheek-teeth of species which feed on tough vegetable fibre may meet the wear and tear of mastication in two ways. The roots remain open so that growth of the tooth continues until age is far advanced, and the hard enamel of the crown dips into the dentine in loops and folds and is itself sometimes covered with a layer of *cement*, so that when the crown is worn, its surface exhibits a complicated pattern of alternating ridges of cement, enamel and dentine, well fitted for its grinding purpose. Perfected teeth of this description are found in the horse and elephant. But other mammals may show marked deterioration of the teeth; the armadillos, for example, have lost the enamel. Finally, in some of the anteaters there is not a vestige of a tooth remaining and this defect has been brought about independently in three distinct orders, represented by the South American Anteaters, the Pangolins and the Echidnas.

The last structures frequently used in classification to which reference must be made are those concerned with the development of the young before birth.

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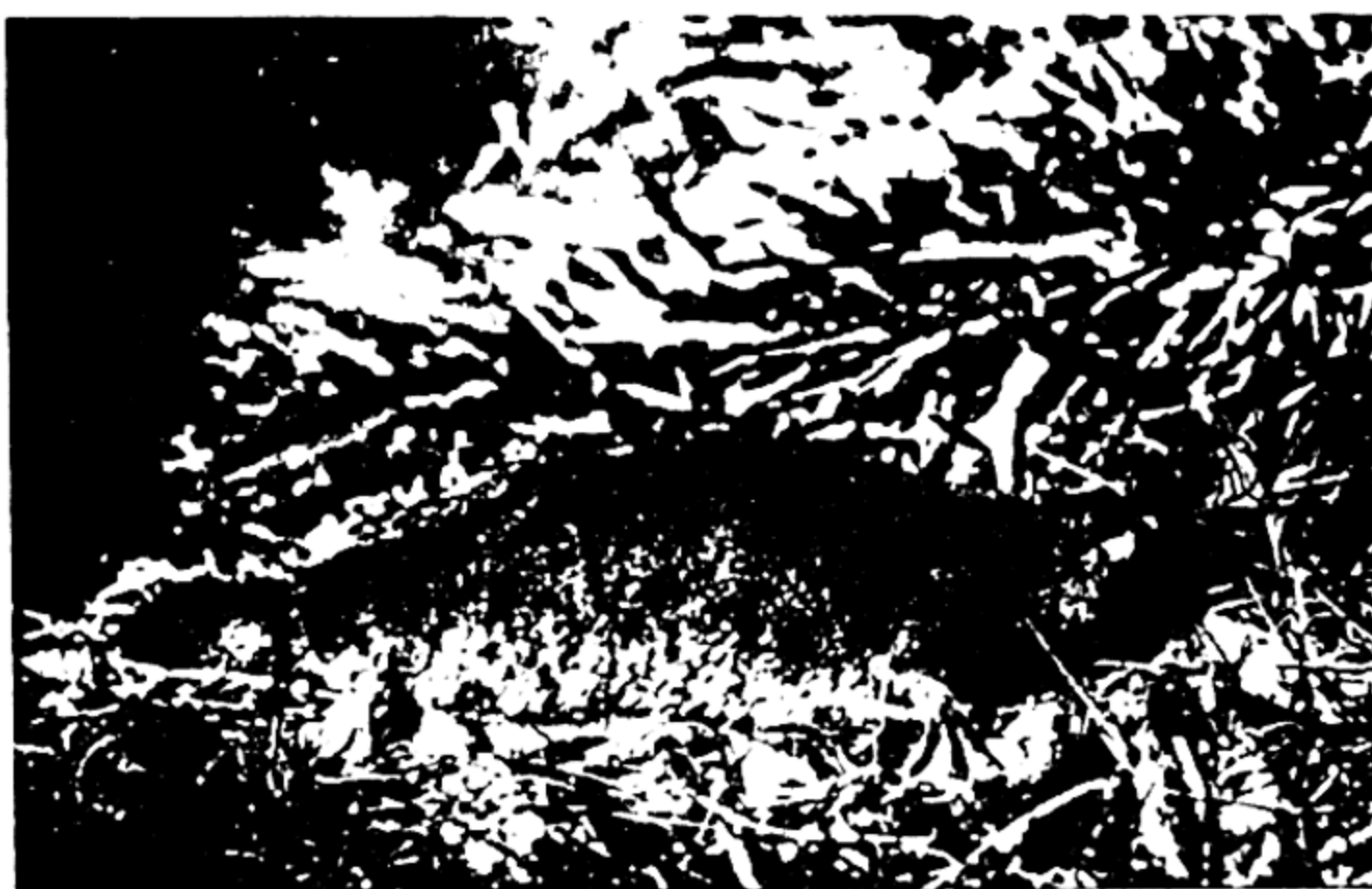
THE SIBERIAN MAMMOTH OR HAIRY ELEPHANT.

It was stated above that the primitive mammal was an egg-layer, like most reptiles. But in only two kinds of existing mammals, the duckbill and the echidna, has this habit been retained. In the rest the young are never at any stage enclosed in an egg-shell and are born in a state of greater or less activity, and in all these, except the kangaroos and their allies, the young during its development is attached to the mother by a nutritive mass of blood-vessels called the *placenta*. According to its form and extent the placenta is called diffused, zonary, discoidal or dome-shaped. At birth it either becomes simply detached from the maternal tissues, or it brings away a considerable portion of them welded to it. The latter is called a deciduate and the former a non-deciduate placenta. Species with a placenta are called *placental*, and those, like the kangaroos, without it, *implacental* mammals.

Order MONOTREMATA (Duckbill, or Platypus, and Echidnas, or Spiny Anteaters)

These animals are distinguished from all other mammals and resemble reptiles in having an interclavicle and complete coracoid bones in the shoulder girdle, a single posterior orifice for the alimentary canal, urinary and genital ducts, and by laying tough-shelled eggs. In these respects the

MAMMALIA (ORDER MONOTREMATA)



By courtesy of [Australian Trade Publicity]
DUCKBILL OR PLATYPUS (*Ornithorhynchus paradoxus*).
 This animal lives in long burrows in the banks of rivers and streams in eastern Australia and in Tasmania. It spends its active hours in the water.

Monotremes are exceedingly primitive; but the young, after being hatched by the heat of the mother's body, as in birds, are fed by her milk, which exudes from a number of pores on the skin, there being no definite teats. There are two families, confined to Australasia.

Ornithorhynchidae.
 This family contains the Duckbill or Platypus (*Ornithorhynchus*

paradoxus), an aquatic species, with the jaws naked and shaped like a duck's beak, the mouth provided with broad, horny teeth, the eyes small, the ears absent, the body covered with close, beaver-like fur, the tail broad, the legs short and the toes webbed, but armed with strong claws. In the male there is a poisonous spur on the back of the heel.

The Duckbill lives in long burrows in the banks of rivers and streams in eastern Australia and in Tasmania. The burrow has its main entrance below the level of the water and expands into a spacious chamber where the animal rests and rears its family of two; and from this chamber a ventilation shaft is carried to the surface of the ground, its aperture being concealed amongst vegetation. The Duckbill spends its active hours in the water, feeding upon small crustaceans and water-snails which it fetches from the bottom, storing the food temporarily in the cheek pouches, to be eaten at leisure at the surface or on land. When asleep the Duckbill rolls itself up into a ball.

Echidnidae or **Tachyglossidae.** This family comprises the Echidnas, known also popularly as the Spiny or Porcupine Anteaters. They have a long, narrow, beak-like snout terminating with the nostrils and small



(W. S. Berridge.)
ECHIDNA OR SPINY ANTEATER (Family *Echidnidae*).
 Echidnas feed mainly after dark, lying up during the day in burrows or rock crevices. When alarmed, they roll up into balls, like hedgehogs.

ECHIDNAS OR SPINY ANTEATERS

aperture of the mouth, through which the extensile worm-like tongue is protruded ; there are no teeth, the ear is absent, the tail is conical and short, the back is armed with mostly white spines, and the feet are broad and provided with strong claws for digging and tearing open the earth mounds of the ants and white ants upon which these animals feed. The male has a spur like that of the duckbill ; and the female is provided with a pouch in which she places her single egg and in which the young one after hatching suckles.

Echidnas feed mainly after dark, lying up during the day in burrows or rock crevices ; and when at rest or alarmed, they roll up, like hedgehogs, presenting an array of spines, their only means of defence, to the enemy.

There are two principal kinds. The Five-toed Echidna (*Echidna aculeata* or *Tachyglossus aculeatus*) has five toes on each foot, short legs and longish, more numerous spines. It is found in Papua, Australia and Tasmania, each of these districts having its peculiar race, the one inhabiting Tasmania being remarkable for the concealment of the spines beneath a coating of long hair. The Echidnas are about one and a half feet in length.

The Three-toed Echidna (*Proechidna* or *Zaglossus bruijnii*) has usually only three visible toes, shorter and fewer spines, but considerably longer legs. When standing erect upon these, the animal, with its long curved snout, looks like a miniature elephant. It is a larger species than the last, measuring from two to two and a half feet long and standing some eight inches high. It is found in Papua but not in Australia.



[W. S. Berridge.
NEW GUINEA ECHIDNA OR BLACK SPINED PORCUPINE ANTEATER (Family *Echidnidae*).

Echidnas have long, narrow, beak-like snouts terminating with the nostrils and the small aperture of the mouth, through which the extensile, worm-like tongue is protruded.

Order MARSUPIALIA (Pouched Mammals)

The Marsupials are principally distinguished from other mammals by the development of the young, which during prenatal growth are not connected with the mother by the tissue of interlocking blood-vessels that is called the placenta. They are implantal mammals. After birth the young instinctively crawls in search of a teat and takes hold of it; the portion of the teat within the mouth thereupon swells so that the young one, unable to loose its hold, hangs inertly to it, milk being periodically pumped into its stomach by the contraction of muscles associated with the mammary glands of the mother. In most cases the teats and young are surrounded or completely covered by a flap of skin forming the pouch from which the order takes its name.

The Marsupials are arboreal or terrestrial, rarely aquatic mammals, exhibiting great diversity of structure, the extreme forms being as different from each other as some of the orders of placental mammals, like the rodents and carnivores, which they adaptively resemble in general appearance. But they are all linked together by numbers of intermediate types and there is no agreement about their classification, some authors relying on the teeth, others on the feet for the division of the order into suborders. Usually they are classified by the teeth into two suborders, the *Polyprotodontia*, which have many small incisor teeth, and the *Diprotodontia*, which have the two front lower incisors much larger than the others when present. But a more satisfactory division is based on the hind feet; these supply a character admitting of no exceptions.

The following is the classification of the Order MARSUPIALIA :

Suborder Eleutherodactyla

- Family *Didelphyidae* (American Opossum)
- „ *Dasyuridae* (Tasmanian Wolf, etc.)
- „ *Notoryctidae* (Pouched Moles)
- „ *Caenolestidae* (Selvas)

Suborder Syndactyla

- Family *Peramelidae* (Bandicoots)
- „ *Macropodidae* (Kangaroos)
- „ *Phalangeridae* (Australian Opossums)
- „ *Phascolarctidae* (Koala)
- „ *Phascolomiidae* (Wombats).

Suborder Eleutherodactyla

The second and third digits of the hind feet are not united and are similar to the fourth and fifth in structure and usually in length. The teeth are variable, being usually insectivorous or carnivorous in type, with the upper canine and usually the lower, longer than the incisors. Hence the

AMERICAN OPOSSUMS

dentition is typically "polyprotodont," the median lower incisors being small. This character, however, fails in one family, the *Caenolestidae*.

Four families, the *Didelphyidae*, *Dasyuridae*, *Notoryctidae* and *Caenolestidae*, belong to this suborder.

American Opossums
(Family *Didelphyidae*).

Distinguished by having the first toe of the hind foot large and typically prehensile, and five pairs of incisor teeth in the upper jaw. The canine teeth are large and



ELEGANT OPOSSUM.

[D. Seth-Smith.



[W. S. Berridge.

AZARA'S OPOSSUM, FROM BRAZIL.

trenchant and the incisors are small and subequal. The tail is usually prehensile and the pouch may be present or absent.

These Opossums range from the United States to the Argentine and there are many different kinds, but they are mostly similar in habits.

The largest is the Common or Virginian Opossum (*Didelphys marsupialis*), characterized by its very soft black and white underfur being covered with long grey or black hairs. The head is usually white, with black stripes; the tail hairy at the root, nearly naked elsewhere and prehensile; and the pouch is present. Large specimens measure from one and a half to two feet from the nose to the root

MAMMALIA (ORDER MARSUPIALIA)

of the tail, the tail being about fourteen inches in length. This Opossum ranges from the United States to Brazil. In habits it is nocturnal, sleeping by day in a hollow stump or hole and wandering by night about the trees or ground in search of any food it can find; birds, eggs, crabs, insects, carrion, nuts and fruit. It is a great pest to poultry-keepers. It is extraordinarily tenacious of life and when mauled, lapses into a state of coma, called "death-feigning." Hence the phrase "playing 'possum." Two or three litters of from six to a dozen young are born in the year and the mother may have two families at a time under her charge, one clinging to her body, the other, newly born, in the pouch. The Crab-eating Opossum belongs to this species.

One of the smallest is the Murine Opossum (*Marmosa murina*), which, like the last, has large ears and a long tail, but is uniformly furry and has no pouch. It is greyish-brown in colour, with dark rings round the eyes. The head and body are about six and the tail eight inches in length. It ranges from Mexico to Brazil, and is not uncommonly imported into this country in bunches of bananas from Demerara and elsewhere.

The Water Opossum or Yapock (*Chironectes minimus*) differs from the arboreal species in having the five toes of the hind feet webbed and cheek-pouches in the mouth. The colour is varied black and grey, the sides being marked with four very broad black stripes extending from the back. The head and body are about one foot in length, the tail a little longer. Its range is from Guatemala to Brazil. This Opossum frequents the banks of streams and rivers and feeds upon shrimps, water insects and small fishes.

Australian Carnivorous Marsupials (Family *Dasyuridae*). These are distinguished from the Didelphyidae by the small size or absence of the first digit of the hind foot and by the presence of four pairs of upper incisor

teeth. The pouch, when developed, opens backwards, but it may be represented by two ridges of skin, or may be absent. The family is restricted to Australasia.

The Tasmanian Wolf (*Thylacinus cynocephalus*), one of the largest of the marsupials, takes its name from its superficial likeness to a wolf. It is, however, greyish brown, with a number of dark



(W. S. Derridge.)

TASMANIAN WOLF (*Thylacinus cynocephalus*).

This is one of the largest of the marsupials. It is greyish-brown in colour and the coat is short and smooth. It stands one and a half feet at the shoulder.

TASMANIAN DEVIL—AUSTRALIAN NATIVE CATS

stripes on the hind quarters, is short coated and has a smooth, thick, tapering tail and weak loins. Nevertheless, it is digitigrade, and has a dog-shaped head with large, erect ears, and stands about one and a half feet in height, and has a tail one and a half feet in length.



(D. Seth-Smith.)

TASMANIAN DEVILS (*Sarcophilus harrisi*).

These are much smaller than the Tasmanian Wolf and somewhat badger-like in build and size. The hair is short, jet black and usually varied with a fair amount of white.

It is now restricted to Tasmania, where it

is sometimes called the "Hyæna" or "Tiger"; but it formerly inhabited the mainland of Australia. Although very rare, it is still found in hilly, timbered country, where it hunts at night for birds and small mammals, including wallabies, which it catches by persistent tracking. In the settled districts it has been killed out, owing to its depredations on farmers' livestock. The litter consists of four young ones, which are carried in the pouch till they outgrow it. Thereafter the mother hides them in the scrub or a cave until they are big enough to look after themselves.

The Tasmanian Devil (*Sarcophilus harrisi*) is much smaller than the Wolf, and is short-legged and plantigrade, with the head disproportionally large as compared with the body. It is somewhat badger-like in build and size, but is short-haired, jet black, usually varied with a certain amount of white. In habits and diet it closely resembles the wolf, feeding on any birds or small mammals it can pounce on unawares, and frequenting any kind of country supplying necessary cover and food. It is highly predacious and capable of killing even wallabies; but it is not the savage animal its name suggests, being susceptible to taming, especially if taken young. The young, usually four to the litter, are born in May, and apparently stay in the pouch for about four months, when the mother provides a nest for them in some secluded spot.

The Australian Native Cats (*Dasyurus*) are less clumsily built than the Devil, and have the feet adapted for climbing and running, and a much longer, bushier tail. Except for being spotted with white, they are rather like genets. The pouch is apparently developed only at the breeding season.

There are many species found in New Guinea, Australia and Tasmania. The largest is the Spotted-tailed Dasyure or "Tiger-Cat" (*Dasyurus maculatus*), the head and body measuring about two feet, and the tail one and a half feet. It inhabits eastern Australia and Tasmania, usually in wooded

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[W. S. Berridge
COMMON DASYURE OR AUSTRALIAN NATIVE CAT
(*Dasyurus viverrinus*).

or bush country. It is capable of killing even wallabies, is a pest to poultry-keepers, and is such a savage fighter that one has been known to get the better of a big tom-cat.

The rest of the species are smaller and have the tail unspotted. The Common Native Cat (*D. viverrinus*), in

which the head and body measure about one and a half feet and the tail less than one foot, is usually olive-grey, with white spots, but black specimens are not uncommon. It is distinguished by the absence of the first digit on the hind foot. In habits it is like the larger species, feeding at night on small animals and lying up by day in hollow logs, holes or rock crevices, where the young, from four to seven in number, are reared after leaving the pouch. Formerly the most plentiful of all the Native Cats in eastern Australia, this species is now rare, owing to its decimation by an epidemic at the beginning of the century.

To this family also belong a large number of mainly insectivorous marsupials occurring in New Guinea, Australia and Tasmania, which from their small size are popularly designated Pouched Mice or Pouched Rats, and are referred scientifically to the genera *Phascogale*, *Dasycercus* and *Sminthopsis*. Some of them occasionally climb trees; but for the most part they are terrestrial, living in burrows or rock crevices. One of the most curious is the Jerboa Pouched Mouse (*Antechinomys laniger*), which has very long hind feet and hops like a Jerboa. Although only a little over three inches long, the tail measuring five inches, it can cover no less than six feet with a jump. It frequents principally the rocky or sandy plains of central Australia.

The Banded Anteater (*Myrmecobius fasciatus*) is a representative of this group, highly modified in adaptation to its diet of ants, its tongue being long and extensile, its cheek-teeth bluntly cusped, and the tactile facial bristles greatly reduced. The general colour is reddish-grey, but the back is black, relieved with white stripes; the tail is long and bushy, the pouch is absent, the head and body measure about nine inches, and the tail six or seven. Now very rare, this animal inhabits south-western Australia, in timbered country where ants, which it licks up with its tongue, are to be found, and where it can shelter among fallen logs or under the roots of trees. As many as seven young have been found clinging to the under-side of the mother.

POUCHED MOLES, SELVAS, BANDICOOTS

Pouched Moles (Family *Notoryctidae*). This family contains a single species, the Pouched Mole (*Notoryctes typhlops*), a type very highly modified in relation to subterranean life. In general form it is very like a mole, having no external ears, vestigial eyes, and short, thick legs; but it has a blunt muzzle covered with a horny shield, and a short, horny knob-tipped tail; its feet are adapted in very different ways for burrowing, only the two outer claws of the fore foot being enlarged, whereas the hind foot is broad and is also adapted for excavation. The female has a pouch with two teats. The colour is white and the length about six inches. The animal lives in the deserts of South Australia and feeds on worms and insects, which it devours with the voracity of a mole. It does not appear to be a deep burrower, but travels along just beneath the surface of the sand in search of food, and is not known to live in burrows. It has, at all events, been found under grass-clumps, and certainly comes to the surface of the ground during and after rains.

Selvas (Family *Caenolestidae*). These little rat-like marsupials are interesting in a scientific rather than a popular sense. Their kinship, on the whole, is clearly with the *Dasyuridae*, which they resemble in the structure of the feet, but in having the median pairs of lower incisor teeth converted into long projecting tusks they resemble the next suborder. One or two species have been discovered, but the best known is the Sooty Selva (*Caenolestes fuliginosus*), which is about the size of a rat, and very similar in appearance, except for its sharper snout. It inhabits Colombia and Ecuador at heights from 5,000 to 11,000 feet; but, except that it lives on the ground, is nocturnal and eats animal food, very little is known of its habits.

Suborder Syndactyla

Here the second and third digits of the hind feet are small, fused to their tips so as to resemble one short digit with two sharp claws; the third digit is typically considerably the largest and in the middle line of the foot. The dentition is typically "diprotodont," the median lower incisors being enlarged; but this character fails in the Bandicoots.

This suborder, restricted to Austra-



[W. S. Berridge.]

RABBIT-EARED BANDICOOT (*Paragalia lagotis*).

This is greyish-fawn in colour, with the end of the tail white. It inhabits south and west Australia.

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lasia, contains five families, the *Peramelidae* (Bandicoots); the *Macropodidae* (Kangaroos and Wallabies); the *Phalangeridae* (Australian Opossums, Sugar Squirrels, etc.); *Phascolarctidae* (Koala or Australian Bear), and the *Phascolomiidae* (Wombats).

Bandicoots (Family *Peramelidae*). The Bandicoots are distinguished by having all the incisor teeth small and the canines trenchant, as in the *Dasyuridae*; but their limbs are like those of the Kangaroos. They live on the ground, nesting in hollows or burrows in the bush or plains, and are omnivorous, eating small animals, especially insects, as well as bulbs, roots, and berries.

The Rat Bandicoots have short ears, five toes in the fore feet, and the tail uncrested. Gunn's Bandicoot (*Perameles gunni*) has no spines in the fur and has the rump banded with dark ' light stripes. The head and body measure eight inches, the tail three and a half inches. It inhabits Victoria and Tasmania.

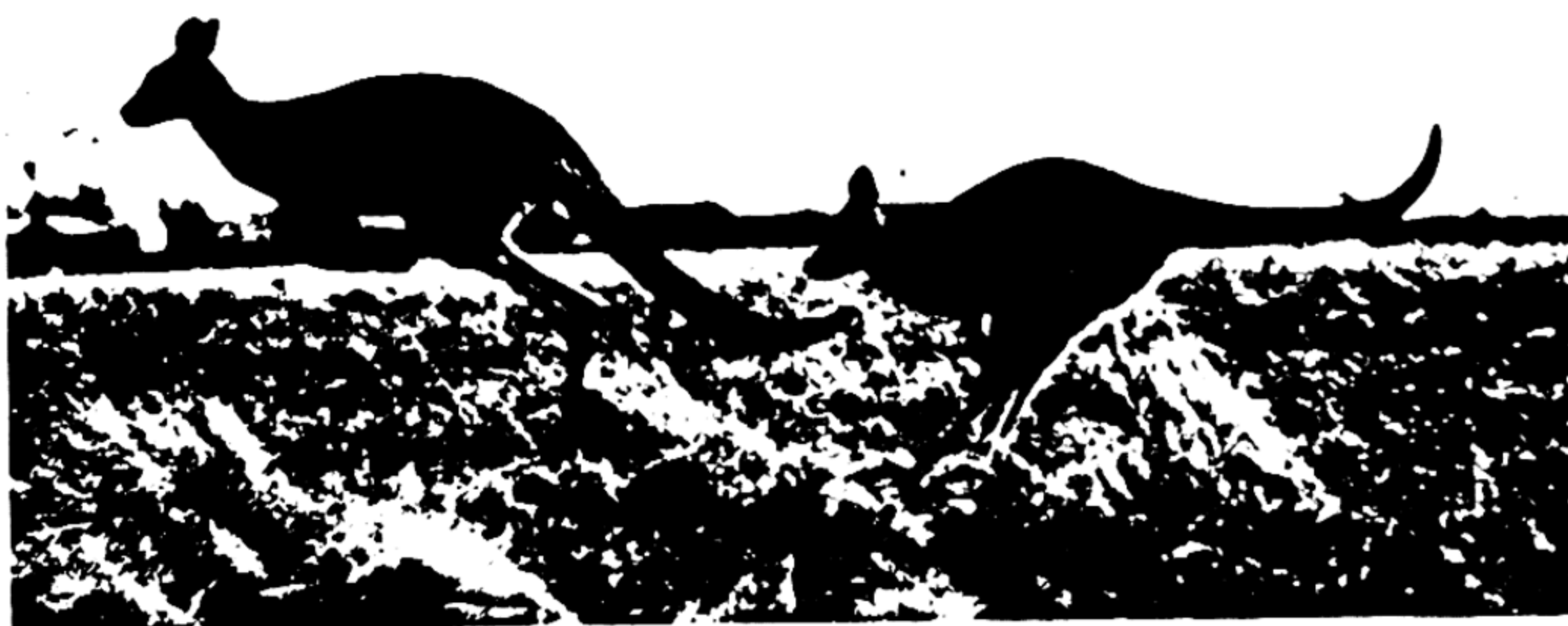
The Short-nosed Bandicoot (*Isoodon obesula*) has spines mixed in the fur and the colour tolerably uniformly greyish-yellow. The head and body are eleven inches in length, the tail about five inches. It is found in Southern Australia and Tasmania. There are many other species, differing from these in minor particulars.

The Rabbit Bandicoots have long ears, the tail crested above, and longer hind legs. The best-known species is the Common Rabbit Bandicoot (*Paragalia lagotis*); this is greyish-fawn in colour, with the end of the tail white; the head and body are about nine, and the tail five inches in length. It inhabits South and West Australia.

The Pig-footed Bandicoot (*Choeropus castanotis*) also has large ears, but is distinguished by having only two functional toes on the fore foot. It is greyish in colour; the head and body measure about ten and the tail four inches in length. It inhabits the grassy plains of the greater part of Australia.

Kangaroos and Wallabies (Family *Macropodidae*). This family differs from the Bandicoots in the teeth; the canines, when present, are never trenchant or larger than the incisors, and the front pair of lower incisors is long and projecting. But the hind feet are like those of the Bandicoots, although longer and adapted for hopping, the first toe being absent, or small and thin, and the fourth enlarged and provided with a hoof-like nail. The tail is long.

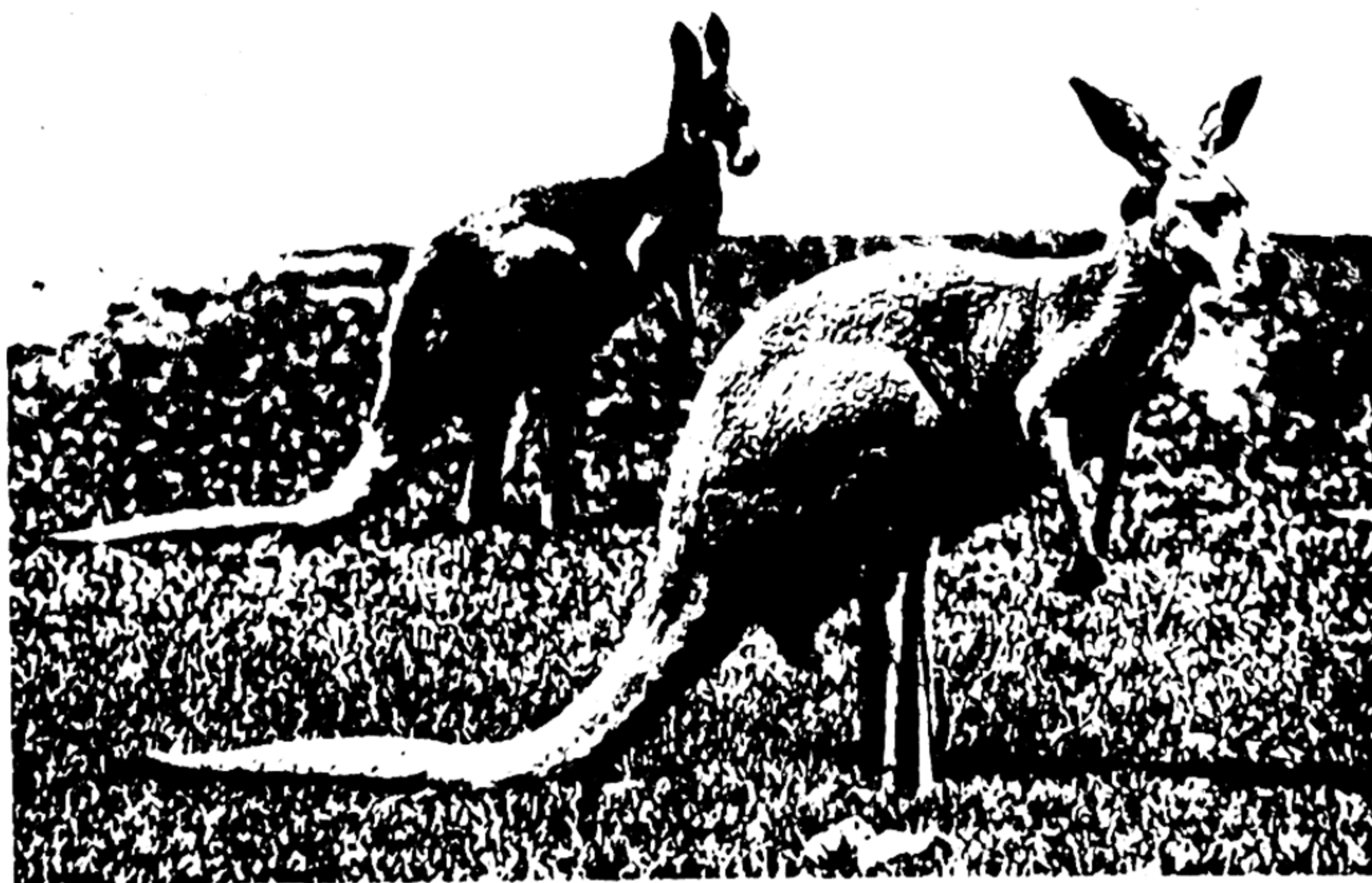
Kangaroos and Wallabies (*Macropus*) differ in size, the smaller species being called Wallabies. Their general form is well known. They have the head and forequarters lightly built and the hindquarters massive and strong, with powerful hind legs and a long, muscular tail, which is used as a fifth leg or prop when the animal is walking or standing upright. When grazing and moving slowly, they progress on all fours, supporting the body on the fore legs and tail and swinging the hind legs forwards; but when going at speed, they cover the ground with a succession of leaps, using the



[G. Morey (Montvale).]

GREAT GREY KANGAROO IN FLIGHT.

A big Kangaroo, when chased and hard pressed, can bound twenty-five feet or more and can clear obstacles five or six feet high.



By courtesy of]

RED KANGAROO (*Macropus rufus*).

[the Commonwealth of Australia.

This is even larger than the Great Grey Kangaroo, and has a woolly coat and longer fore limbs. It inhabits the open plains of central Australia.

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hind legs only, with the body inclined forwards and the tail stretched out behind to balance it. A big Kangaroo, when chased and hard pressed, can bound twenty-five feet or more and clear obstacles five or six feet high, if not more. They are adapted to all kinds of country, the Kangaroos being found in the open plains, forests or hillsides; the Wallabies usually keeping to the bush and scrub, feeding on grasses and low-growing vegetation.

But a few Kangaroos are arboreal and subsist mainly on foliage.

The pouch is large, with its orifice opening upwards or forwards. There seems to be no definite breeding season; and the young, usually one but occasionally a couple, are at first tiny and naked, but in about four months become covered with hair and afterwards may be seen looking out of the pouch and even attempting to nibble grass. When about a quarter grown, they venture forth and exercise by the mother's side, but on a hint of danger scramble back to the pouch for safety, making use of it until they have outgrown its dimensions.

Big male Kangaroos, which are larger than the females, are redoubtable antagonists when brought to bay,



[Dorien Leigh.

GREAT GREY KANGAROO (*Macropus giganteus*), WITH YOUNG. This sometimes stands nearly six feet in height, is typically grey in colour, and inhabits well-timbered country in west and east Australia, also Tasmania.

defending themselves by kicking with their hind legs. They frequently indulge in "sparring" matches, standing up and scratching at each other's heads with their fore paws and kicking with the hind legs, standing on the tail and one leg while the other delivers its strokes. This natural habit has been taken advantage of by showmen in what is called "training"

KANGAROOS AND WALLABIES

Kangaroos to "box." Kangaroos and Wallabies are far less plentiful than they used to be. They are a nuisance on the grazing grounds of sheep-farms; but the great factor in the reduction of their numbers is the value of their skins to the fur trade.

They are found in New Guinea and Tasmania, as well as all over Australia, except in the desert parts.

Only a few of the best known of the many species can be noticed. The Great Kangaroo (*Macropus giganteus*), the "Old Man" of the earlier colonists, can stand nearly six feet high. It is typically grey in colour and inhabits well-timbered country in west and east Australia and also Tasmania, where it may be reddish in tint. The Red Kangaroo (*M. rufus*) is even larger than the last and has a woolly coat and longer fore limbs; the male is usually red and the female greyish. It lives in the open plains of central Australia. Both these species are gregarious, but the Wallaroo (*M. robustus*), a smaller but more heavily-



(W. S. Berridge)
RED-NECKED WALLABY AND YOUNG.



DERBIAN WALLABY.

[Jumas's Press.]

built species, varying locally from blackish to red, is found solitary or in pairs on forested hillsides in western and eastern Australia.

Of Wallabies, or small Kangaroos, there are a great many species, varying in habitat as much as the Kangaroos, one of the largest and most familiar being the Black-tailed Wallaby (*M. ualabatus*), which is partial to damp, bushy gullies, and was

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formerly abundant in south-eastern Australia. The head and body measure between two and a half and three feet and the tail about one and a half feet in length.

The Fawn Nail-tailed Wallaby (*Onychogalea unguifera*) is distinguished by having a horny spur at the tip of the tail. It is fawn in colour, the head and body measure about three feet in length and the tail one and a half feet. It inhabits Western Australia. Other species are found elsewhere, but in habits they resemble ordinary Wallabies.

The Brush-tailed Rock Wallaby (*Petrogale penicillata*) differs from the others in having the claw of the large toe short and blunt. It is about the size of the Black-tailed Wallaby, and is found in eastern Australia, frequenting the mountain ranges and displaying extraordinary agility in hopping about on boulders and rocky ledges.



URSINE TREE-KANGAROO (*Dendrolagus ursinus*) FROM NEW GUINEA. Tree kangaroos have the hind legs comparatively short, and although adapted to tree climbing, frequently descend to the ground, on which they can run with considerable speed.

The Tree-kangaroos (*Dendrolagus*) differ from the preceding in having the hind legs comparatively short, only a little longer than the fore legs, which are strongly made. Although adapted by their limbs for tree climbing, these Kangaroos, of which there are some dozen species, found in New Guinea and Queensland, are by no means restricted to arboreal life, frequently descending to the ground, on which they can run with considerable speed, but they ascend trees if pursued. They are about the average size of the larger Wallabies. The Ursine Tree-kangaroo (*D. ursinus*), of north-western New Guinea,

RAT-KANGAROOS—AUSTRALIAN OPOSSUMS

and Bennetts' Tree-kangaroo (*D. bennettianus*), of north-eastern Queensland, may be cited as examples.

The Rat-kangaroos or Bettongs (*Potoroinae*) are distinguished by their prehensile tails and the large size of the three middle claws of the fore feet. They are about the size of rabbits and lie up during the day in burrows or nests made of grass, which they carry in bundles to the spot by means of their tails. They were



[W. S. Berridge.]

RAT-KANGAROO (Family *Potoroinae*).

This is about the size of a rabbit and lies up during the day in a burrow or nest made of grass, which it carries in bundles to the spot by means of its tail.

formerly abundant and a great pest to farmers, but are being exterminated by the imported foxes. They are widely distributed in Australia, the commonest being the Rufous Rat-kangaroo (*Aepyprymnus rufescens*) of eastern Australia and the Brush-tailed Bettong (*Bettongia penicillata*), found in Southern Australia.

The Musk Rat-kangaroo (*Hypsiprymnodon moschatus*) differs from the rest of the family and resembles the next in having a distinct, though small, first toe on the hind foot, which otherwise is like that of the Kangaroos. It also has a naked, scaly tail. The colour is rusty-grey; the head and body are about ten and the tail six and a half inches in length. It inhabits Queensland and lives in damp scrub, feeding on insects as well as vegetables.

Australian Opossums, Phalangers, Sugar Squirrels, etc. (Family *Phalangeridae*). These are distinguished from the Kangaroo family by having the hind feet short and adapted for climbing, instead of for hopping or running, the first toe, or hallux, being large, thick, and prehensile, and the fourth of ordinary length. The tail is long and generally prehensile. The muzzle is short and broad and the tongue not extensile.

The Vulpine Opossum (*Trichosurus vulpecula*), the best-known member of this family, is a heavily-built, thick-furred animal, with short legs, a long tail, bushy throughout except at the tip beneath, where it is prehensile; and none of the digits of the fore foot is opposable. The colour is usually grey, but varies locally to red, brown or black. The size is also variable, the head and body measuring from about one foot to nearly two feet in length and the tail from ten inches to fourteen inches. It is found practically throughout Australia and in Tasmania, wherever eucalyptus trees, upon

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the foliage of which it mainly feeds, grow. But it also eats the leaves and fruits of cultivated plants. The single young one, born in the winter, stays in the mother's pouch for two months and is subsequently carried on her back until able to fend for itself.



AUSTRALIAN RING-TAILED OPOSSUM (*Pseudochirus*)
These Opossums have the tail tapering and short-haired towards the end.
They are skilful climbers.

The Ring-tailed Opossums (*Pseudochirus*) are lighter and smaller than the Vulpine, have the tail tapering and short-haired towards the end, and the first and second digits of the fore foot separated from the rest and opposable to them. A large number of species is known, most of them living in New Guinea, the others in Australia. In diet and habits they closely resemble the Vulpine Opossum, but are more skilful climbers, the most active being the Lemur-like Opossum (*P. lemuroides*) found in Queensland, which descends trees by means of long leaps from branch to branch. Its general colour is greyish-brown, and its length is about fifteen inches, the tail being some three inches shorter. As in some other species, the female constructs a large nest of twigs and leaves interwoven with the branches of the scrub.

The Cuscuses (*Phalanger*) differ from the Ring-tailed Opossums principally in having the end of the tail naked above and below. There are many species, found mostly in the islands to the north of Australia. The best-known are the Black Cuscus (*Ph. ursinus*) of Celebes, which is blackish-brown in colour, the two sexes being alike and the Spotted Cuscus (*Ph. maculatus*), found in New Guinea and North Australia, which is irregularly



Photos] AUSTRALIAN OPOSSUM (Family *Phalangeridae*). [W. S. Berridge.

mottled with white, black and red in the male, the females being typically grey and black, and larger than the males. These are large, heavily-built species, the head and body being over two feet long and the tail some one and a half feet. They are all comparatively slow climbers, spending the day curled up in the branches of trees and bushes.

PHALANGERS—HONEY-MOUSE

The Striped Phalangers (*Dactylopsila*) may be known by their pattern of broad, longitudinal black and white bands and by having the fourth toe of the fore foot much longer than the others. The average length is about ten inches, the tail being either longer or shorter than the head and body. There are several different kinds, found



(W. S. Berridge.)

SPOTTED CUSCUS (*Phalanger maculatus*).
The male is irregularly mottled with white, black and red, the female being typically grey and black, and larger than the male. They spend the day curled up in the branches of trees and bushes.

mostly in New Guinea, the typical species being the White-footed Phalanger (*D. trivirgata*). These Phalangers are largely insectivorous and use their thin, long fingers for extracting grubs from holes and crevices in trees.

The Opossum-mice, or Dormouse-phalangers (*Dromicia*), are well named from their general mouse-like appearance and size and their habit of sleeping through the winter, lying up in nests and subsisting on an accumulation of fat stored mostly in the tail during the autumn. They are widely distributed, the most familiar being the Dwarf Opossum-mouse (*D. nana*), found in Victoria and Tasmania.

Very distinct from the typical Phalangers, of which it is a specialized offshoot, is the little Honey-mouse (*Tarsipes spenserae*), characterized by its



(F. W. Bond.)

LESSER FLYING PHALANGER (*Petaurus*).
In these "Sugar Squirrels" the flight-membrane extends from the wrist to the ankle. The mother carries the young one on her back after it has been two months in the pouch.

very long snout, extensible tongue and defective back teeth. Its colour is greyish, ornamented with three dark stripes on the back; the length is about three inches, the tail being a little more. It is found only in Western Australia, and feeds mainly on small insects, but is very partial to honey, which it extracts from flowers by means of its long tongue.

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Flying Phalangers and Sugar Squirrels. Several Phalangers resemble Flying Squirrels in gliding from tree to tree, supported on a flap of membrane extending along the sides of the body.



[Dorien Leigh.

KOALA OR NATIVE BEAR OF AUSTRALIA (*Phascolarctos cinereus*).

This has cheek pouches and no visible tail, the feet being well adapted for grasping. It feeds by night on the foliage of eucalyptus trees.

In the larger Flying Phalanger (*Petauroides volans*) the membrane runs from the elbow to the knee. It has large ears, the head and body measure about one and a half feet in length and the bushy tail a few inches more; the colour is blackish-grey above, whitish below. It inhabits eastern

FLYING PHALANGERS

Australia, and feeds on eucalyptus leaves at night. The longest measured flight was eighty yards from the top of one tree to the foot of another.

In the smaller Flying Phalangers or Sugar Squirrels (*Petaurus*), the membrane extends from the wrist to the ankle. The commonest species is the Short-headed Flying Phalanger (*P. breviceps*),

which is grey above and white below, the head and body being about seven inches and the tail eight inches in length. The mother carries the young one on her back after it has been two months in the pouch. Its natural home is eastern Australia, but it is abundant in Tasmania, where it was introduced.

The Pigmy Flying Phalanger (*Acrobates pygmaeus*) has a very narrow membrane, but a feather-like tail, and broad pads on the tips of the toes. The colour is fawn-grey above, white below. The head and body measure only two and a half inches and the tail three inches in length. It feeds

on insects, and inhabits eastern Australia.

The Koala or Native Bear (Family *Phascolarctidae*). The Koala (*Phascolarctos cinereus*) differs from the phalangers in having cheek pouches and no visible tail. Its ears are large and hairy, its nose prominent and rounded, its fur thick, and the feet of its powerful limbs are well adapted for grasping. It attains a length of about two and three quarter feet. It is restricted to eastern Australia, and lives in eucalyptus trees, feeding on the foliage by



(D. Seth-Smith.)

AUSTRALIAN PIGMY FLYING PHALANGER
(*Acrobates pygmaeus*).

This little animal has a very narrow flight-membrane, but a feather-like tail, and broad pads on the tips of the toes.



(Dorrien Leigh.)

COMMON HAIRY-TAILED PHALANGER (*Trichosurus vulpecula*),
KNOWN AS THE OPOSSUM IN AUSTRALIA.

MAMMALIA (ORDER MARSUPIALIA)

night and sleeping curled up in a forked branch by day. The single young one, born in mid-winter, stays in the pouch for about three months. For the next three months the mother carries it on her back. The scarcity of this animal is due to persecution by the fur-trade, and to decimation by epidemics.

The Wombats (Family *Phascolomidae*). The Wombats (*Phascolomis*) are distinguished by having the teeth and mouth modified for gnawing exactly as in the rodents. They are terrestrial, the paws being adapted for burrowing, with the first digit of the hind foot greatly reduced in size. In appearance they resemble gigantic guinea-pigs. In habits they are nocturnal, lying up in deep burrows by day and feeding on grasses, roots and bark by night. A single young one is born in the winter and is independent of its mother when about six months old. There are two species. The Ursine Wombat (*Ph. ursinus*) has coarse black or grey fur and a naked nose, and measures from three to four feet in length. It is found in Australia and Tasmania. The Hairy-nosed Wombat (*Ph. latifrons*) has soft grey fur and a hairy nose. It inhabits the drier, more inland districts of eastern Australia.

Order EDENTATA (Sloths, Anteaters and Armadillos)

The mammals of this order are principally distinguished from the Pangolins (*Pholidota*) and the Aard-Varks (*Tubulidentata*), formerly associated with them, by having accessory interlocking processes on some of the vertebrae of the hinder part of the back. Teeth, when present, are defective in enamel, and the front of the mouth is always toothless. The order includes several gigantic prehistoric species, but space will not permit of their description here.

The order is restricted to America and is divisible into two suborders,

the Pilosa or Hairy Edentates and the Loricata or Armoured Edentates.



WOMBAT (*Phascolomis mitchelli*).

Wombats resemble in appearance gigantic guinea-pigs. They lie up in deep burrows by day and feed on grasses, roots and bark by night.

(W. S. Berridge.)

Suborder Pilosa (Hairy Edentates)

Members of this suborder are distinguished by the genital and urinary ducts and the intestine opening close together on a common eminence or in a saccular fold of the

HAIRY EDENTATES—SLOTHS

skin. The skin is thickly clothed with hair, and in existing species has no bony plates imbedded in it. This sub-order is subdivided into two very distinct tribes, the *Tardigrada* or Sloths and the *Vermilingua* or Anteaters.



(W. S. Berridge.
TWO-TOED SLOTH (*Choloepus didactylus*).
There are two toes only on the fore feet, and the soles of the feet are entirely naked. This Sloth inhabits Brazil.

Sloths (Tribe *Tardigrada*). In animals belonging to this tribe the head is short and globular, with an abbreviated muzzle, massive jaws and a short, broad tongue; the mouth, which has a tolerably long gape, is provided at the sides with simple, peg-like teeth; the tail is short or vestigial; the limbs are elongated and slender, the feet narrow and long, alike on all four limbs and never have more than three digits, which are tightly tied together and armed with very long sub-equal claws; and the coat is long and shaggy.

There are two well-marked genera of Sloths, the Two-toed Sloth or Unau (*Choloepus*) and the Three-toed Sloth or Ai (*Bradypus*), both being commonly assigned to the family Bradypodidae.

The Two-toed Sloth (*Choloepus*) has two toes only on the fore feet, the soles of the feet are entirely naked, the tail is vestigial, the nostrils are large and thick-rimmed, the ears are valvular, the hair on the crown grows backwards, the front tooth of each jaw is large and canine-like, and there are six or seven vertebrae in the neck. The common species (*C. didactylus*), with seven neck-bones, inhabits Brazil; and the related form, Hoffman's Sloth (*C. hoffmanni*), with six neck-bones, extends from Ecuador to Costa Rica.

The Three-toed Sloth (*Bradypus*) has three toes on the fore foot. The soles of the feet are almost entirely covered with long hair, the tail is quite distinct, the nostrils are small, the ears not valvular, the hair on the crown grows forwards, fringing the face, the teeth are all alike, and there are nine neck-bones. These Sloths range from Brazil northwards to Nicaragua, but the species are not well understood, the best known being the typical species (*B. tridactylus*), which has between the shoulders a curious patch of soft, short hair, black in the centre and yellow at the edges, and the Collared Sloth (*B. torquatus*), which is ornamented with a black band round the neck.

MAMMALIA (ORDER EDENTATA)

The Sloths are so completely adapted to arboreal life that they are practically helpless on the ground, to which they never voluntarily descend. In trees, however, they are perfectly at home, although slow, deliberate climbers. They move along the underside of branches, suspended by their



[D. Seth-Smith.]

THREE-TOED SLOTH (*Bradypus tridactylus*).

In this Sloth there are three toes on the fore feet and the soles of the feet are almost entirely covered with long hair. The tail is quite distinct.

claws, with the back towards the ground, and sleep in that attitude, with the head thrown forwards on the breast. They are absolutely defenceless, but are admirably concealed by the abundant growth on the hairs of a microscopical alga-like plant which makes them look like tufts of greenish moss. They feed on foliage, using the long, hooked claws of their fore legs to pull the leaves within reach of the mouth. The newly-born young, of which there is but one, clings to its mother by clasping her with its limbs after the manner of a baby monkey.

Anteaters (Tribe *Vermilingua*). In

the members of this tribe the head is elongated into a slender snout and the jaws are very weak; the mouth is toothless and tubular, with a small gape, and the tongue is exceedingly long and worm-like; the tail is nearly as long as the head and body; the limbs are stout, comparatively short, and the fore and hind feet are dissimilar, the hind foot having

HAIRY EDENTATES--ANTEATERS

four or five sub-equal toes, whereas in the fore foot the third toe is much larger than the second and has a huge falcate claw ; the hair of the body is not long and shaggy.

There are three well-defined genera : *Myrmecophaga*, *Tamandua* and *Cyclopes*, forming the family Myrmecophagidae. In the Great Anteater (*Myrmecophaga tridactyla*) the snout is very long ; the tail is rigid and provided with a crest of long, stiff hairs above and below ; the legs are tolerably long ; the hind foot has five short, separated toes and the whole sole is naked and applied to the ground ; the fore foot has four toes, the first and fourth being short, the second and third larger and armed with long claws ; on the outer side of the foot there is a big, cushion-like pad, on which the Anteater rests when walking, the claws being turned inwards. The general colour is blackish-grey, relieved by a broad black stripe, with white margins on the shoulder, and grey fore legs. The standing height is about two feet. Its habitat is the forests of South and Central America. It is purely terrestrial, spending the day sleeping on the ground curled up with its great tail spread over the body, the long hairs sloping on each side, like a roof, to throw off the rain. At night it wanders abroad in search of ant-hills and termite mounds, which it rips open with the claws of its powerful hind limbs to get at the insects it licks up by means of its long, wormlike tongue, rendered sticky with saliva. It is an inoffensive creature, but when attacked defends itself boldly by striking savagely at its assailants with its muscular fore legs, while standing with its back to a tree, its vulnerable snout tucked down on its breast. Inexperienced dogs get severely



[F. W. Bond.

LESSER ANTEATER OR TAMANDUA (*Tamandua tetradactyla*).
This is much smaller than the Great Anteater. Its colour varies considerably, the general hue being reddish-yellow, varied more or less with black patches.

MAMMALIA (ORDER EDENTATA)

lacerated by its claws ; and it is said that even a puma is cautious about coming to close quarters with the animal at bay. The female produces only one young at a time ; and this she carries on her back until capable of looking after itself.

The Lesser Anteater or Tamandua (*Tamandua tetradactyla*) is much smaller than the last-named, is covered all over with short hair, has a flexible, prehensile tail, a much shorter snout and a considerably larger pad on the outside of the fore foot. Its colour varies considerably, the general hue being reddish-yellow, varied more or less with black patches. The total length is about three and a half feet and the height about eight inches. Except that the Tamandua is an expert climber and spends most of its time in trees, it resembles the Great Anteater in habits ; and like that animal is found in South and Central America.

The Two-toed Anteater (*Cyclopes didactylus*) is distinguished by having two toes only on its fore feet and four on its hind ; its tail is prehensile, and this animal is more thoroughly adapted for arboreal life than the Tamandua, never voluntarily coming to the ground. It is covered with silky yellow fur, is only about the size of a rat, and inhabits the forests of Central and South America.

Suborder Loricata (*Armoured Edentates*)

This suborder, containing the Armadillos (Family *Dasypodidae*), differs essentially from the Pilosa in having the vent separated from the genital and urinary orifices, and the skin, which is typically scantily hairy, provided with a protective coating of bony scales, which, however, vary considerably in development.

The head is conical with the muzzle narrowed ; the mouth has a large gape, numerous teeth and a moderately long tongue, the legs are short and the tail long or of medium length. The bony armour, extending from the snout to the end of the tail, is absent from the lower side. It is usually divided into a head-shield, a scapular shield, covering the shoulders, and a pelvic shield, covering the rump, these latter two shields being separated by a varying number of movable bands of scales enabling the body to be more or less rolled into a sphere. Armadillos are purely terrestrial, living in burrows in the forests or plains and feeding mostly upon insects, but eating other food as well. They are more widely distributed than the sloths and anteaters, ranging in America from Texas to Patagonia. There are many different kinds, differing in a variety of ways ; but only the principal types can be mentioned.

Only two closely-related species, namely the Six-banded Armadillo (*Dasypus sexcinctus*) and the Peludo (*D. villosus*), are commonly imported alive to this country. They are about sixteen inches long, with the tail about half that length, and have from six to eight movable bands on the back, the muzzle conical, the ears short and far apart, and five toes on each

EDENTATES—ARMADILLOS



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen

GREAT ANTEATER (*Myrmecophaga tridactyla*).

The general colour is blackish-grey relieved by a broad black stripe, with white margins on the shoulders, and grey fore legs. The height is about two feet. Its habitat is the forests of South and Central America.

foot, the claws of the fore feet, as in all Armadillos, being long, for the purpose of digging. The Six-banded Armadillo is found in Brazil and Paraguay, and the Peludo, which is the hairier, in the Argentine. They feed upon insects, snakes, the eggs of ground-nesting birds, and on carrion and even on grain and green vegetables when animal food fails. The litter consists of from two to four young, which are born and reared in the burrow.

The Giant Armadillo (*Priodontes gigas*) differs from the foregoing in having as many as twelve or thirteen movable bands, much bigger claws on the third and fourth toes of the fore foot, and the scales on the base of the tail irregularly arranged and not disposed in bony rings. As its name indicates, it is a relatively large animal, as big as a small pig, the head and body measuring nearly a yard long and the tail about one and a half feet. It lives in the forests of Brazil and Guiana.

In the Three-banded Armadillos, the Apar (*Tolypeutes tricinctus*), for example, there are only two or three movable bands, the tail is very short, the fore foot may have only three toes and the claws of the hind foot are flattened and nail-like. They walk on the tips of the claws of the fore feet and can roll up more completely than any other species. The head and body measure a little over one foot and the tail is about two inches in length. They inhabit the pampas of the Argentine and Buenos Ayres. The Pebas or Nine-banded Armadillos (*Tatusia novemcinctus*) have from six free bands

MAMMALIA (ORDER PHOLIDOTA)

in the young to nine in the adult ; the ears are long and set close together on the back of the head, and the snout and tail also are long. This Armadillo is also distinguished by having a pair of teats on the abdomen as well as the pair on the breast, and by producing a litter of from six to twelve young ; and it is the only Edentate in which the permanent teeth are preceded by milk-teeth. The head and body may measure one and a half feet in length, and the tail is over one foot. There are one or two closely-related species, ranging from Texas to the Argentine ; the hairy Peba (*T. pilosa*) of Peru being remarkable for the thick coating of hair which completely covers the scales.

Very different from all the preceding is the Pichiciago (*Chlamyphorus truncatus*), so-called from the truncated shape of the hinder end of the body due to the pelvic shield forming a vertical semicircular plate. It is also distinguished by the sides of the face and the lower surface being covered with silky hair, by the minute size of the ears, by the scales on the back forming a continuous series of movable bands passing over the neck, and by the spatulate tail, but above all by the armour of the back forming a loose cloak attached to the body only along the spine. This, the smallest of the Armadillos, measuring only about six inches long, lives in very sandy districts in the Argentine and Chile. It digs with great rapidity and uses the flat hinder end of the body to block its burrow.

Order PHOLIDOTA (Scaly Anteaters or Pangolins)

The Scaly Anteaters or Pangolins, the only known representatives of this order, are of unknown ancestry and occupy an isolated position in the class Mammalia. They were formerly classified with the South American Anteaters in the Edentata ; but it is now known that the characters they



PEBA OR NINE-BANDED ARMADILLO (*Tatusia novemcinctus*).
The head and body may measure one and a half feet in length and the tail is over one foot.

(W. S. Berridge.

have in common, namely a toothless mouth, with a small orifice, a long, elastic tongue, and enlarged glands for the copious secretion of saliva, as well as powerful limbs and claws for tearing down the nests of white ants, are merely adaptive resemblances, also independently acquired by the Spiny Anteaters or Echidnas

SCALY ANTEATERS OR PANGOLINS

(see page 610), due to similar feeding habits, their diet being ants, termites and worms.

The most striking peculiarity of the Pangolins is the protective coating of large, rigid, overlapping but erectile and sometimes spiny scales, formed of consolidated hairs, which cover the crown, the whole of the body above, the outside of the limbs and the tail above and below, the underparts being soft and hairy. To these scales, coupled with the



(W. S. Berridge.
WHITE-BELLIED TREE PANGOLIN (Family *Manidae*).
Pangolins have a protective coating of large, rigid, overlapping but erectile and sometimes spiny scales. Like hedgehogs, these animals roll into a compact ball when attacked.

emission of nauseous secretions, the Pangolins, otherwise defenceless, comparatively inactive and unintelligent, owe their survival. When attacked, they seldom attempt to escape, but, like hedgehogs, roll into a compact ball, presenting to the enemy an impenetrable armour of horny plates and emitting at the same time their obnoxious odour.

Pangolins (Family *Manidae*) are confined to the warmer parts of the old world. By skeletal and external differences they fall into two natural groups, one Asiatic, the other African. Of the African group there are two types. One (genus *Smutsia*) contains the giant Pangolin of Central Africa and the Short-tailed or Temminck's Pangolin of South Africa, which are about the size of pigs, with the tail shorter than the head and body, and are terrestrial, living in burrows; the other (genus *Phataginus*) also contains two species, which are about as big as rabbits, have the tail prehensile and much longer than the head and body, and are arboreal, living in the forests of West Africa. The Asiatic species, ranging from the Himalayas and south China to Ceylon and Java, are intermediate in size and habits between the two African types, being climbers as well as burrowers. The best known are the Thick-tailed Pangolin of India, where it is commonly known as the Armadillo, and the Eared Pangolin (genus *Manis*), inhabiting Nepal and China.

Pangolins are said to produce from one to three young at a birth, but nothing is known of their longevity, since they never survive long in captivity.

Order ARTIODACTYLA (Cloven-hoofed Mammals)

This order is the first of the series of Hoofed Mammals, which were formerly associated as the Ungulata. But it is now agreed that the superficial resemblances in shape between such creatures as Cattle and Horses, or Hippopotamuses and Rhinoceroses, are adaptations to habits independently acquired along different lines of development from primitive stocks distinguished at a comparatively early period in the evolution of Placental Mammals; and there is evidence that the Artiodactyla were an offshoot from the branch which also gave rise to the Carnivora.

The order is essentially distinguished by the structure of the feet, in which there are never more than four toes, the first being absent, the third and fourth the largest and symmetrically paired, the median axis of the limb passing between them. The second and fifth, generally functionless or absent, are, when present, also alike and symmetrically placed outside



JAVAN WILD BOAR (*Sus vittatus*). [W. S. Berridge.]

or behind the main digits, which are almost always unguligrade. The stomach is usually complex and there is no dilatation of the intestine known as the caecum. The order is divided by the pattern of its teeth and the structure and mechanism of its stomach into two main suborders, the *Bunodontia* or

Non-ruminantia and the *Selenodontia* or *Ruminantia*. The various genera are again classified into tribes and families as follows:

Order ARTIODACTYLA

Suborder BUNODONTIA or NON-RUMINANTIA

Family *Suidae* (Pigs)

„ *Hippopotamidae* (Hippos)

Suborder SELENODONTIA or RUMINANTIA

Tribe Tylopoda (Camels and Llamas)

Tribe Tragulina (Chevrotain [Mouse Deer])

Tribe Pecora.

Family *Bovidae* (Cattle, Antelopes and Sheep)

„ *Antilocapridae* (Prongbucks)

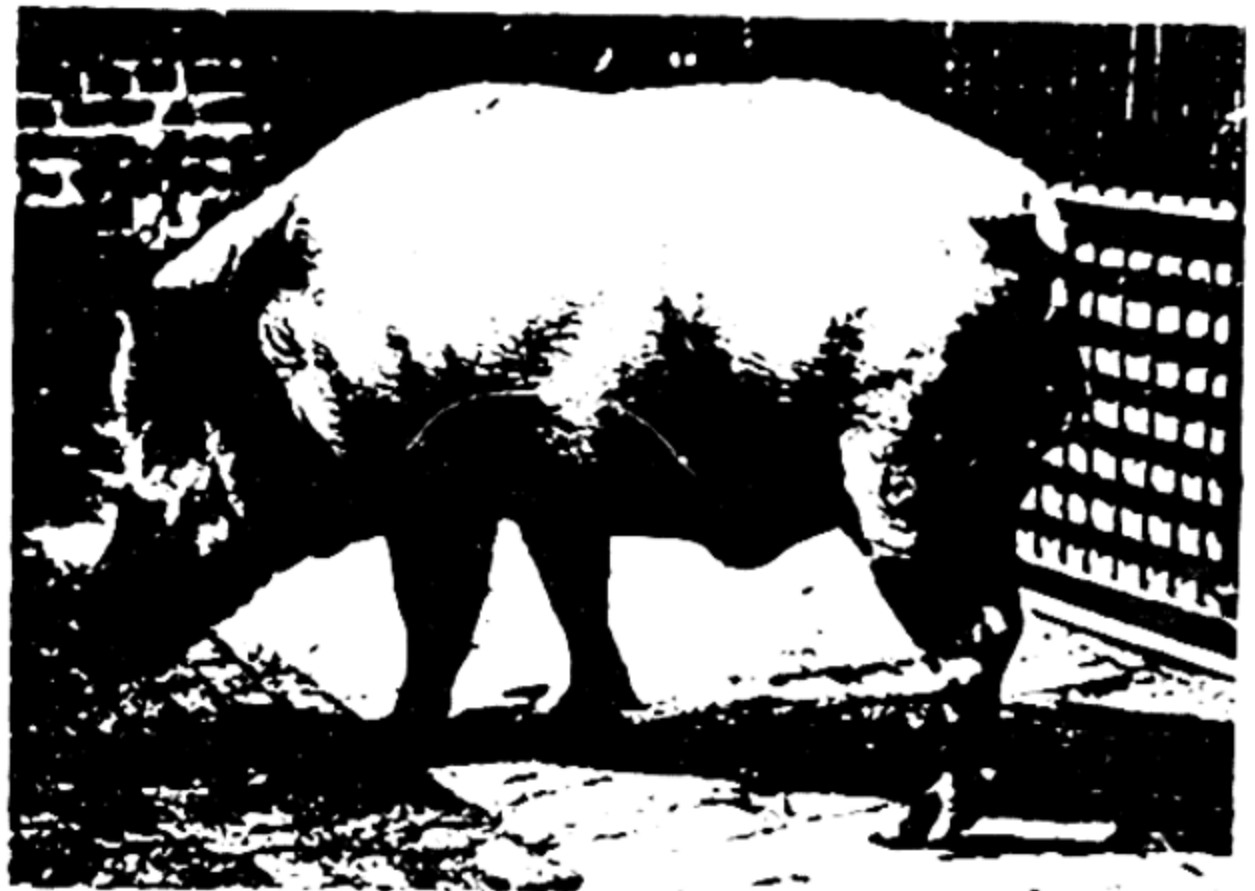
„ *Giraffidae* (Giraffes)

„ *Cervidae* (Deer).

PIGS (FAMILY SUIDAE)

Suborder BUNODONTIA or NON-RUMINANTIA

This suborder, containing the Pigs (Family *Suidae*) and the Hippopotamuses (Family *Hippopotamidae*), is essentially distinguished by the crowns of the cheek teeth being studded with tubercles, and by the comparatively simple, non-ruminating stomach. The bones between the wrist or "knee" and the ankle or "hock" and the digits are not united.



INDIAN WILD BOAR (*Sus cristatus*).
In this animal the crest on the neck and shoulders is greater than in the European species.

Pigs (Family *Suidae*). The pigs are adapted for terrestrial life and are unguligrade. The snout is unlike that of any other family of Artiodactyla, the nostrils opening on a flat, disk-shaped plate which terminates the muzzle, and is supported by a special bone which aids its function for rooting the soil. The mouth is always armed with tusk-like canines of permanent growth.

In habits pigs are gregarious, living in forest or bush, and are omnivorous in diet, eating any small animals they come across, although feeding mainly on roots, tubers and other vegetable substances.

They are found in temperate and warm countries of both the Eastern and Western Hemispheres and are divided into two sub-families, the *Suinae* or Old World Species and the *Pecarinae* or New World Species.

The Wild Pigs of the Old World (Suinae). The Wild Pigs of Europe, Asia, and Africa have the upper canines growing upwards or outwards, a simple stomach, no gland on the back, and four toes on the hind as well as on the fore feet.

The best-known member of the group is the European Wild Boar (*Sus scrofa*) from which our domesticated breeds of pigs were derived. It formerly inhabited Great



Photos] BABIRUSSA (*Babirussa babyrussa*).
In this animal the upper canines grow upwards through the skin of the muzzle and curve backwards towards the forehead. It is a native of Celebes.

MAMMALIA (SUBORDER NON-RUMINANTIA)

Britain and still survives in the wilder parts of Europe. The colour is dusky-brown or blackish-grey, and the coat consists of coarse bristles overlying thick underwool. The head is long, the neck short and the body powerfully built. The head and body measure about four and a half feet in length and the standing height is nearly three feet. The tusks of the boar project beyond the upper lip, and with these formidable weapons, and aided by quickness and strength, the boar is more than a match for any animal its own size. The nearly-related Crested Wild Boar (*S. cristatus*), of India, has, when attacked, been known, indeed, to kill tigers. These animals, however, are seldom aggressive unless provoked. The boars usually live apart, the herds or "sounders" consisting of sows and young. They are prolific animals, often producing litters of half-a-dozen twice in the year. The period of gestation is four months, and the young are light brown, with dark stripes. The duration of life is twenty years or more.



[W. S. Berridge.
WART-HOG (*Phacochoerus aethiopicus*).
The most grotesque of all the Wild Swine. It frequents the open plains and veldt of Africa.

Many other species are found in Asia as far eastward as Japan and Celebes, the Bearded Wild Boar (*S. barbatus*) of Borneo and Sumatra being remarkable for its very long head and small ears. The Pigmy Wild Hog (*Porcula salvania*), found in Nepal and Bhutan, is interesting from being the smallest of the family. It is only one foot in height, has a shorter tail, and only two

instead of six pairs of teats.

Very distinct from the preceding is the Babirusa (*Babirusa babirusa*) of Celebes, in which the upper canines grow upwards through the skin of the muzzle and curve backwards towards the forehead, the lower canines, unique in the family for not being kept sharp and short by wearing against the upper, being very long. The colour is greyish-brown and the skin is nearly naked and wrinkled. The litter consists of two young only.

In Africa south of the Sahara there are three distinct kinds of Wild Swine. The Bush-pig (*Potamochoerus porcus*) is distinguished from *Sus* by its longer, tufted ears and by the presence in the male of bony bosses on the skull supporting two pairs of gristly warts on the muzzle. There are several local races, the most interesting being the typical form found in Madagascar, where it is the only indigenous representative of the Artiodactyla; the Common Bush-pig (*P. p. koiropotamus*), the Bosch Vark of the Boers, very similar to the last and inhabiting East and South Africa;

BUSH-PIG—FOREST-HOG—WART-HOG

and the Red Bush-pig or River-hog (*P. p. porcus*), found in the forests of West Africa, which is distinguished by its redder colour and shorter, smoother coat. These Pigs are about two feet high; but in habits and the colouring of the young they resemble *Sus*.



[Sport & General.]

WEST AFRICAN BUSH-PIG (*Potamochoerus porcus*).
This has long, tufted ears and, in the male, bony bosses on the skull supporting two pairs of gristly warts on the muzzle.

The Forest-hog (*Hylochoerus meinertzhageni*), which, owing

to its secluded life in the forests of Central Africa, was not discovered until 1904, is bigger, more bristly and blacker than the Bush-pigs, the boar standing up to two and three-quarter feet, and further differs in its greatly-expanded nose-disk, and in the tip of the upper tusk not being sharpened by the lower. The sow has only two pairs of teats and the young are striped.

The Wart-hog (*Phacochoerus aethiopicus*), called Vlackte Vark by the Boers, is the most grotesque of all the Wild Swine. The snout and nose-disk are even more expanded than in the Forest-hog, and the tusks are longer and the skin nearly naked, except for a mane of long bristles along the back. The boar is between two and two and a half feet in height, and the young, usually four or six to the litter, are unstriped. This species frequents the open plains and veldt of Africa, often sheltering in the burrows of the Aard



EAST AFRICAN BUSH-PIG.

[W. S. Berridge.]

Vark (page 729), and associating in the open with antelopes and zebras. When running, it has the peculiar habit of carrying the tail erect, with the tufted end curled backwards.

The American Wild Pigs, or Peccaries (Sub-family *Pecarinae*) are distinguished by the downward direction of the upper tusks, the saccular stomach, the loss of the outer small hoof on the

MAMMALIA (SUBORDER NON-RUMINANTIA)



[By courtesy of]

[Carl Hugenbeck's Tierpark, Stellingen.]

COLLARED PECCARY (*Pecari tajacu*).

This animal takes its name from the white stripe on each shoulder, the general colour being blackish-grey.

hind foot, and by the presence of a large scent gland on the back. The commonest kind is the Collared Peccary (*Pecari tajacu*), which ranges from Texas to Patagonia. It takes its name from the white stripe on each shoulder, the general colour being blackish-grey. The other kind, the White-lipped Peccary (*Tayassu pecari*), has no collar, is brown

in tint above, and whitish below. It is slightly larger, standing about one and a half feet in height. It ranges from Mexico to Paraguay. Although comparatively small, Peccaries are formidable, fearless animals in the herd and have been known to kill and eat the Jaguar.

Hippopotamuses (Family *Hippopotamidae*). Hippopotamuses are amphibious, equally at home in the water and on land. Their feet, adapted for walking on muddy soil, are digitigrade, and are provided with a large pad-like sole behind the two median digits. The muzzle has no disk-like termination, but is broad and rounded, with the nostrils on its summit and in line with the similarly high-set eyes and ears. Thus the animal can breathe, smell, see and hear with only the top of its head at the surface and the rest of it immersed; the skin is smooth, hairless or nearly so: the body is long and bulky, the tail short, and the legs short and stout. In addition to the tusk-like canines, the central pair of lower incisors also form a pair of forwardly-directed tusks of permanent growth.

Hippos are now restricted to Africa; but the discovery of extinct species in late Tertiary times in Europe, including England, and in India, shows that the group is a northern one, which has survived



[W. S. Berridge.]

HIPPOPOTAMUS (*Hippopotamus amphibius*).

The hippo is restricted to Africa. There are several local races, differing very slightly in appearance and habits.

HIPPOPOTAMUS

only in its present African home. But it must have entered Africa at a comparatively early period, judging from the finding of remains of extinct species in Madagascar.

Common Hippopotamus. This species (*Hippopotamus amphibius*) is distinguished by its huge size, long body, big head, with bulging eyes and short legs with compact feet. A good-sized bull stands from four and a half to five feet at the shoulder and the head and body measures twelve feet or so in length, the weight being over 8,000 lbs., between three and four tons. The age to which they attain can be known only from captive



[Acrofilm.]

HIPPOPOTAMUSES IN AN AFRICAN RIVER.

Formerly hippos were plentiful in all the big rivers of Africa, but sportsmen and native hunters have contributed to lessening their numbers.

specimens. A bull, named "Obaysh," which was captured when only a few days old in the Upper Nile in July, 1849, died in the Zoological Gardens in March, 1878, when close upon thirty years old; and a female, named "Guy Fawkes," of which Obaysh was the sire, was born on November 5th, 1872, and died on March 20th, 1908, when nearly thirty-five and a half years old.

Several local races of this hippo, differing slightly from each other in size and in some minor cranial characters, have been named, but they are all very similar, both in appearance and habits.

Formerly hippos were plentiful in all the big rivers of Africa, even

MAMMALIA (SUBORDER NON-RUMINANTIA)

in the lower Nile. But European sportsmen, who covet their tusks as trophies, and native hunters who kill them for their hides and flesh, have contributed to lessening their numbers. Nevertheless, they are still abundant in some places. But in the settled districts they are becoming annually scarcer because of the practical impossibility of cultivating land near the rivers where they occur. Not content with the natural supply of vegetable food, they raid fields of corn or other produce at night, and some idea of the loss a farmer may suffer from a visit of a single hippo may be gathered from the circumstance that "Obaysh," in his prime, required a daily allowance of one hundred pounds weight of corn, hay, roots and green food. Added to this, a hippo will trample down and destroy in a night as much food as he eats, possibly more.

With its broad muzzle, abbreviated tail and stumpy limbs, the hippo is clearly not a swift swimmer. It is merely adapted for lying immersed with its organs of special sense above the surface to warn it to sink altogether on detecting danger, for slow paddling or for walking along the bottom in shallow water and for browsing on subaqueous plants, which it uproots with its tusks. Sportsmen estimate that the animal stays under water for about five or ten minutes ; but it is capable of much longer submergence. A specimen in the Zoological Gardens, for instance, which was frightened by a dog entering its house, was timed to stay down twenty-nine minutes. And to illustrate the difference in temperament between animals of the same kind, it may be added that another hippo was so enraged by the intrusion of a stray dog entering its pond for a swim, that it plunged into the water and killed the dog with one snap of its great jaws.

Despite its bulk and weight, the hippo is much more active on land than its appearance suggests and can descend even steep banks with surprising ease. As a rule it spends the day drowsing in the rivers or lying out on their banks and shoals, and starts to feed on weeds or forest vegetation after nightfall. In habits it is gregarious and its voice is a succession of snorting roars, which can be heard for miles.

The males are pugnacious and frequently fight amongst themselves and are dangerous to attack from small boats or canoes ; but the females, which are much smaller, are more timid, unless they have young to defend. The period of gestation is from eight to nine months and the mother comes ashore to give birth to her calf, of which there is as a rule only one, rarely two. It is soon capable of following her to the water and at times suckles beneath the surface ; and while it is quite small, she carries it on her back, out of the water, when swimming any distance.

Pigmy Hippopotamus. This species (*Choeropsis liberiensis*) looks like the young of the larger species. In conformity with its more terrestrial habits, it is less heavily built, the body being relatively shorter, the back more arched, the head smaller, the legs less stumpy, with the toes more loosely united so as to be capable of greater expansion. The height is

PIGMY HIPPOPOTAMUS

only about two and a half feet and the weight about four hundred pounds. The period of gestation is the same as in the larger species ; and from records of specimens kept at the Zoological Gardens, the span of life is probably also the same.

This species is restricted to Liberia and Sierra Leone in West Africa and is found in the forest near water, to which it retreats when alarmed. But it is on the whole less aquatic in habits and more active on land than its larger ally.

Suborder Selenodontia or Ruminantia

The first name for this section is taken from the folding of the surface of the grinding teeth into crescent-shaped ridges, a further dental peculiarity being the invariable absence, at least in the adult, of incisor teeth in the front of the upper jaw, their place being taken by a pad of hardened gum. With these features is associated the habit of "chewing-the-cud" or ruminating, which is dependent upon the structure of the stomach. In its most highly - developed



[G. P. A.]

PIGMY HIPPOPOTAMUS (*Choeropsis liberiensis*).

This is more terrestrial than the larger species and is less heavily built. The height is only about two and a half feet. The species is restricted to Liberia and Sierra Leone.

form, possessed by Cattle, Sheep, Deer, and others, the stomach consists of four compartments communicating by narrower passages. The first is a huge sac, called the rumen or "paunch," which has its lining membrane covered with close-set papillae. The second, known as the reticulum or "honey-comb," has its membrane developed into a network of ridges like a honey-comb. The third, still smaller, is a sieve, called the psalterium or "manypplies," because its lining membrane is raised into a number of closely-packed plates, like the leaves of a book (psalter), the edges of which nearly meet in the middle of its cavity. The fourth, the abomasum or "reed," is an elongated sac with its membrane raised into a number of longitudinal folds. It is in this fourth compartment that gastric juice is secreted and true digestion of food takes place. It represents the true stomach of ordinary Mammals, the other compartments

MAMMALIA (SUBORDER RUMINANTIA)

being expansions of the oesophagus or throat, which opens into the stomach at the junction of the paunch and honey-comb and from its orifice a channel with muscular walls passes along the upper wall of the honey-comb to the "manyplies."

The "cud-chewing" action of this stomach is as follows: fresh food, after mastication, is swallowed and passes into the paunch, where it lies for some time to soak and soften. By the contraction of the paunch it is then regurgitated and again masticated. When swallowed a second time, it passes along the channel to the "manyplies" and makes its way between the plates of this compartment to the "reed," where it is digested.

The Selenodont or Ruminant Artiodactyls are divided into three tribes: the *Tylopoda* (Camels and Llamas), *Tragulina* (Chevrotains), and *Pecora* (Oxen, Sheep, Antelopes, Giraffes and Deer).

Camels and Llamas (Tribe *Tylopoda*). These Ruminants are distinguished by having a tusk-like outer incisor tooth, as well as a canine, in the upper jaw, and a tusk-like canine separated from the incisors in the lower jaw. The mouth, thus armed, is used for fighting in a way unknown in other Ruminants. The feet are digitigrade, consisting of only two digits provided with a thick pad beneath and tipped with nail-like hoofs. The stomach has three compartments only, and the walls of the paunch are furnished with small pouches, the orifices of which can be closed by a circular muscle.

The tribe contains a single family, *Camelidae*, containing the Camels and the Llamas.

Camels. The Camels (*Camelus*) are distinguished by their large size, short rounded ears, humped backs, the union of the digits to form a broad



BACTRIAN OR TWO-HUMPED CAMEL (*Camelus bactrianus*).
This has shorter legs than the Arabian One humped Camel, or Dromedary.

foot, and their longish tails. There are two species, the Arabian one - humped Camel or "Dromedary" (*C. dromedarius*) and the Bactrian two-humped Camel (*C. bactrianus*), which also differs in having shorter legs. All the dromedaries are domesticated animals; but although there are wild examples of the Two-humped Camel in Central Asia, these,

CAMELS (CAMELUS)

like some of the wild horses of the same districts, may be the descendants of specimens escaped from captivity. The Bactrian Camel is adapted to life in the steppes of Central Asia, whereas the Dromedary is fitted to the sandy plains of Arabia and North Africa. They are essentially desert animals, exceedingly hardy, and capable of withstanding great privations and extremes of heat and cold. They naturally feed on coarse, desert vegetation; and, living in districts where food may be scarce or difficult to find, they are provided with the humps of fatty tissue for sustenance when their natural diet fails. That is the reason why the humps may be reduced to mere bags of skin in poorly-fed beasts.

It is frequently stated that the cells of the stomach are reservoirs for water especially designed for these animals living in deserts, where droughts are likely to occur. That is not the case. In well-fed camels these cells are always packed with food. In a starved camel, no doubt, when the contents of the stomach are fluid, the cells will be filled with it; and there is, perhaps, no reason to reject the well-known stories of Arabs threatened with death from thirst, killing their camels for the fluid in their stomachs.

The broad, flat, leathery-soled feet enable the camel to traverse loose sand, in which a horse would sink at every step. But there are other characters attesting adaptations to a desert habitat. Compelled habitually to sleep or rest in the open on hard ground, the camel has its chest, knees and thigh joints shielded with horny pads to prevent abrasion of



[W. S. Berridge.

DROMEDARY AND YOUNG (*Camelus dromedarius*).

A sturdy camel can carry some six hundred pounds, going thirty miles a day, although the walking pace is only three miles an hour.

MAMMALIA (SUBORDER RUMINANTIA)

the skin against the rough or gritty soil. These are present in the newly-born calf. Other modifications obviate the discomfort and danger of sandstorms. The sides of the tail, for instance, are fringed with hairs to protect the underlying parts and the bare skin on the inside of the thighs from the wind-driven grains; the small ears can be tucked down out of harm's way, and the nostrils are valvular and lined with hairs to exclude the particles of flying grit.

Camels vary in colour from dark brown to dirty white, but are never piebald like most domesticated animals. The part played by the camel in inter-tribal trade in remote times can only be inferred from historical records and from its usefulness at the present time. But it is known that the wealth of chiefs and tribes was measured by their herds of camels, and its value depended upon its provision of flesh, milk, leather, wool, labour and transport power, in districts where sheep, cattle and horses are difficult to feed and keep.

By reason of their great size and strength, sturdy camels can carry some six hundred pounds, going thirty miles a day, although the walking pace is only three miles an hour. But there is a lightly-built breed of dromedary not used for heavy bales, which will carry its rider at about twice that speed and cover double the distance in the same time.

Although the usefulness of the camel to man's service has earned for it the title "Ship of the Desert," the animal has defects of temper which at times render it exceedingly troublesome. It has gained a reputation for stupidity and obstinacy from its resolute refusal to budge when it wishes to lie down and rest; and during the rutting season the males are excessively quarrelsome, not only fighting amongst themselves, but savagely biting their owners or anyone who ventures near them.

Llamas. The Llamas (*Lama*) have no hump, are smaller and more lightly built than camels; they also have longer, pointed ears, a short, bushy tail, a thick fleece of wool and narrow feet, with the digits only joined for half their length. They are not adapted for desert life; but are found up to the snow-line in the Andes of South America, their feet being fitted for traversing rocky hill-sides and the thick coat protecting them from the severe cold of those altitudes. They live in herds of over a hundred individuals sometimes and are comparatively defenceless, trusting to their agility to escape from enemies. But when exhibition in a menagerie has taught them fearlessness of man, they may be dangerous at times, charging their keepers, striking them down with their fore feet and biting them severely with their sharp teeth. They also have the well-known and annoying habit of spitting when upset. There are two wild species, the Huanaco or Guanaco (*Lama huanacus*) and the Vicugna (*Lama vicugna*).

LLAMA—HUANACO—VICUGNA

Huanaco. This animal is considerably the larger of the two, standing from three and a half to four feet at the back, and having a relatively longer head. Its general colour is a pale yellow-brown, with an ashy-grey head, and white below. It also has a wider geographical distribution and a more varied habitat, occurring not only in the Andes of Peru and Bolivia, but throughout the plains of the Argentine and Patagonia and even in Tierra del Fuego. It is fearless of water and has been observed swimming from island to island in the neighbourhood of Cape Horn. In Patagonia, it is not uncommon to find great accumulations of the skeletons of these animals in one spot, showing that it is the custom of sick or old individuals to seek a particular place wherein to die.

Vicugna. This species is less than three feet in height, and has a shorter head of the same tawny hue as the body. It inhabits the Andes of Southern Ecuador, Peru, and Northern Bolivia at higher altitudes than the Huanaco, and is not found in the Pampas region farther south.

Since llamas are the only hoofed animals indigenous to South America, except some deer and peccaries, it is not surprising that the earliest settlers in the country, the Incas, domesticated them as the Tartars and Arabs domesticated the camels. When the Spaniards conquered South America, llamas were the only beasts of burden the natives possessed. They kept vast herds of them



By courtesy of] [Curl Hugenberg's Tierpark, Stellingen.
VICUGNA (*Lama vicugna*).

This is a wild species, standing less than three feet in height. It is tawny in colour, and inhabits higher altitudes than does the Huanaco.

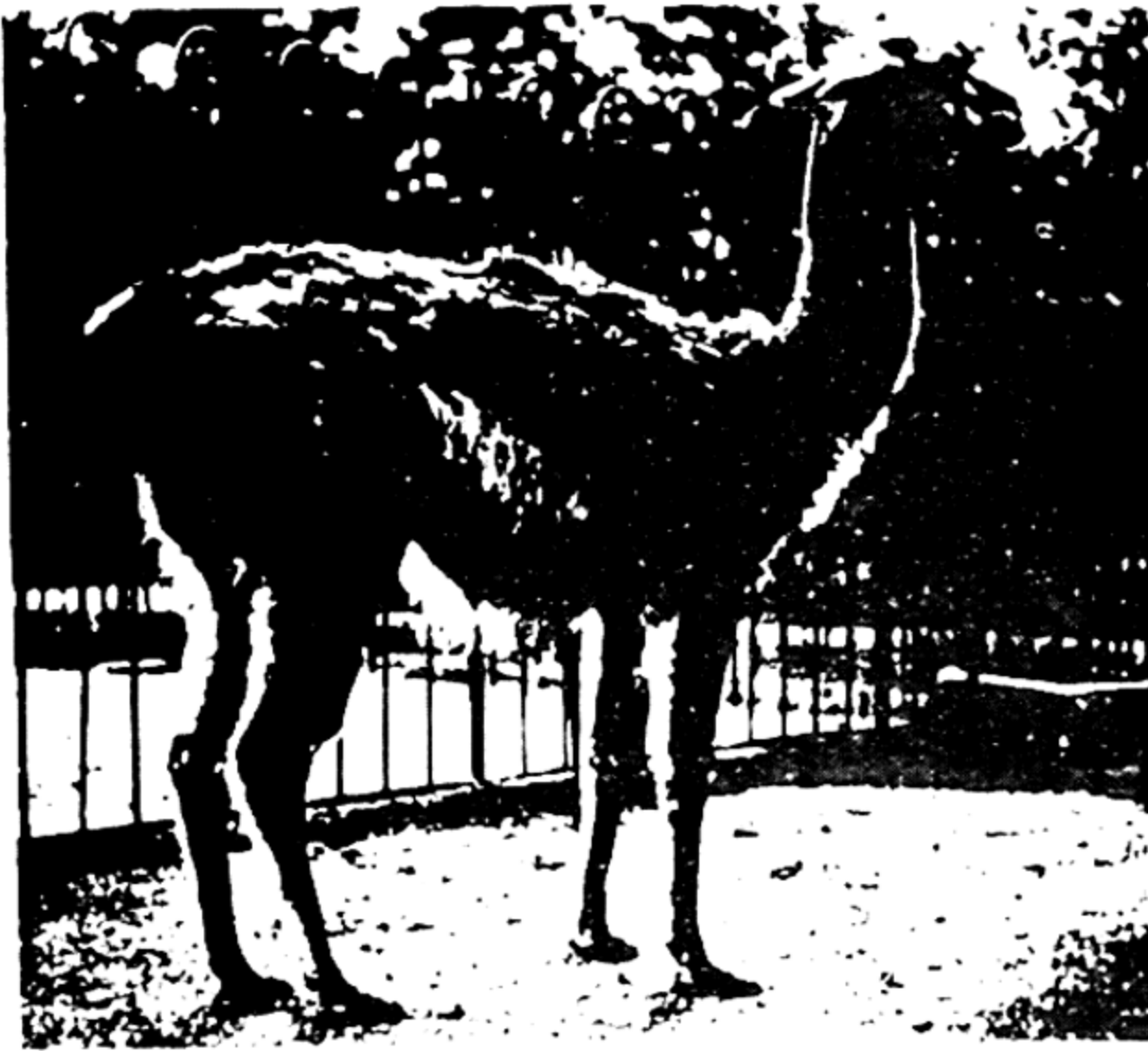


[W. S. Berridge.

LLAMA (*Domestic breed*).

The llama is capable of carrying about one hundredweight. Its feet are fitted for traversing rocky hill-sides, the thick coat protecting the animal from the severe cold of high altitudes.

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HUANACO OR GUANACO (*Lama huanacus*).
This is a wild species and stands from three and a half to four feet at the back. In general colour it is a pale yellow brown, with an ashy-grey head, and white below.

and merchandise, and even for riding. But the introduction into South America of sheep, horses, asses and, more particularly of mules, which are as sure-footed and hardy and much more powerful than llamas, has largely deprived these animals of their usefulness.

Llamas and Alpacas vary in colour from black or brown to white or a piebald mixture of the two. It is generally supposed that both these breeds are descendants of the wild Huanaco, which on account of its superior size would naturally be preferred to the Vicugna for domestication. But there are certain differences between the wild and the tame animal which suggest the possibility of the descent of the domesticated breeds from a third species now wholly reclaimed from a wild state.

and employed them, not only for transport, but for their hides, wool, flesh and milk. There are two distinct breeds, the typical Llama and the Alpaca.

Alpaca. This is the smaller of the two, and was especially kept for the luxuriance of its wool, which is famous for its quality the world over. This breed was not used for transport, that being the duty of the stronger llama, which is capable of carrying about one hundredweight, and was largely employed for fetching ores from the mountains, the removal of household goods



Photos]

[W. S. Berridge.

ALPACA.

Before the introduction into South America of sheep, this animal was especially kept for the luxuriance of its wool. This breed was not used for transport.

CHEVROTAINS OR MOUSE-DEER



WATER CHEVROTAIN (*Hyemoschus aquaticus*.)

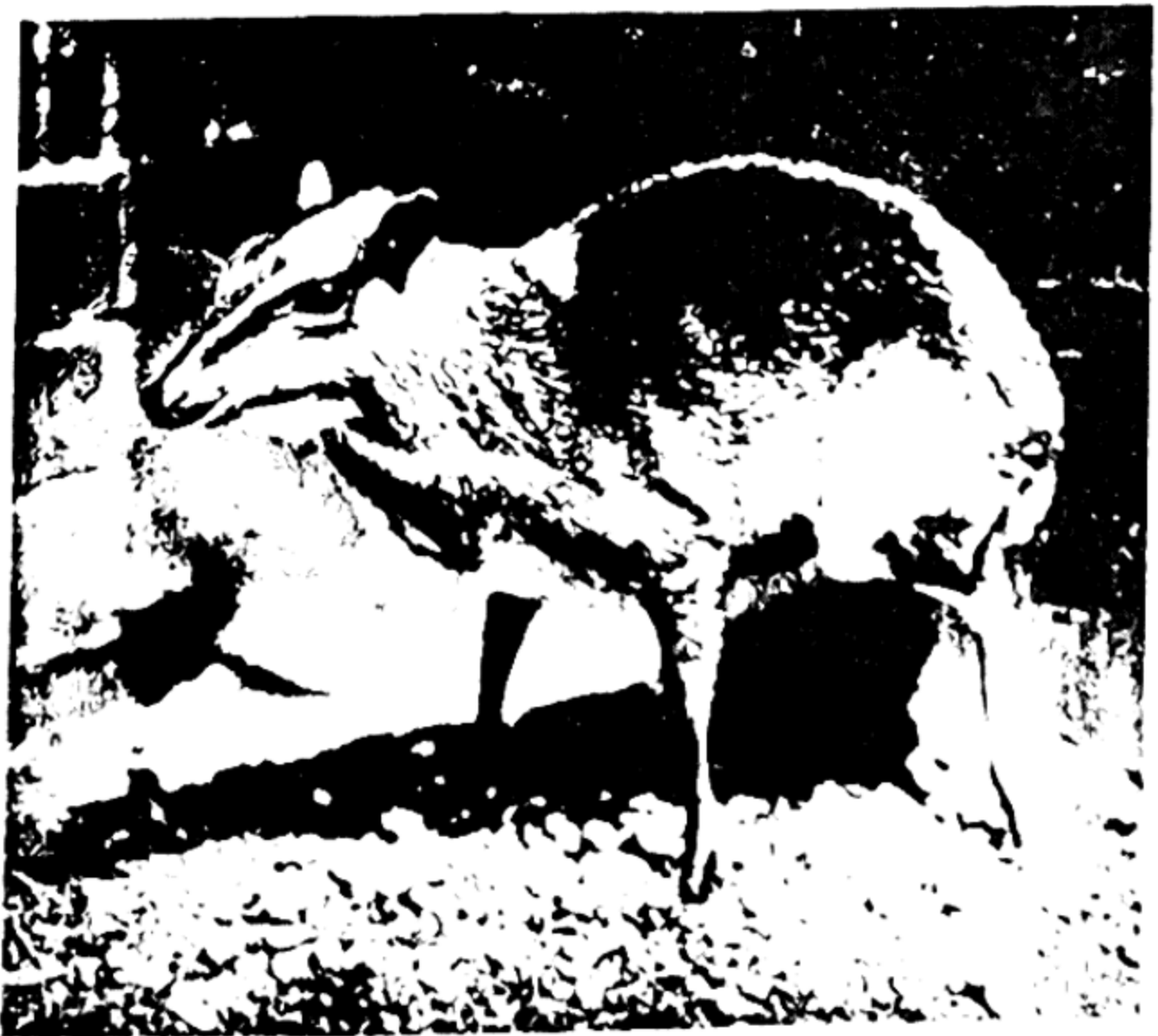
This animal is found near water, and is a good diver and swimmer. It is a native of West Africa.

Chevrotains or Mouse-deer (Tribe *Tragulina*). The Chevrotains or Mouse-deer (Family *Tragulidae*), the smallest of the Artiodactyls, resemble the next tribe, the Pecora, in the structure of their front teeth and feet; but the bones supporting the third and fourth digits are less completely united to form

a "cannon-bone," and the corresponding bones supporting the second and fifth digits are entire, the whole limb being much more primitive and approaching that of the pigs. In the stomach, the third compartment, well developed in the Pecora, is rudimentary. The absence of horns is made good by the large, tusk-like upper canines.

The Chevrotains are dainty little creatures about the size of hares, inhabiting the jungles and forests of tropical Asia and Africa. Being timid and defenceless, they lie up by day in sheltered places, only venturing out at dusk to feed. One or two young are born at a time.

The species of the typical Chevrotains (*Tragulus*), represented by the Kanchil (*T. kanchil*) and the Napu (*T. javanicus*), are uniformly coloured, usually chestnut-red. They inhabit south-eastern Asia from Burma to Borneo, and the Philippines. The Indian and Ceylonese Chevrotain (*Moschiola meminna*) is brown, ornamented with white spots and stripes. The West African or Water Chevrotain (*Hyemoschus aquaticus*) also has a pattern of white marks, but is a larger, thicker-legged



[Photos]

NAPU OR JAVAN CHEVROTAIN (*Tragulus javanicus*)

The Chevrotains, or Mouse-deer, are dainty little creatures about the size of hares, inhabiting the jungles and forests of tropical Asia and Africa.

MAMMALIA (SUBORDER RUMINANTIA)

species, found near water, into which, being a good diver and swimmer, it plunges to escape danger.

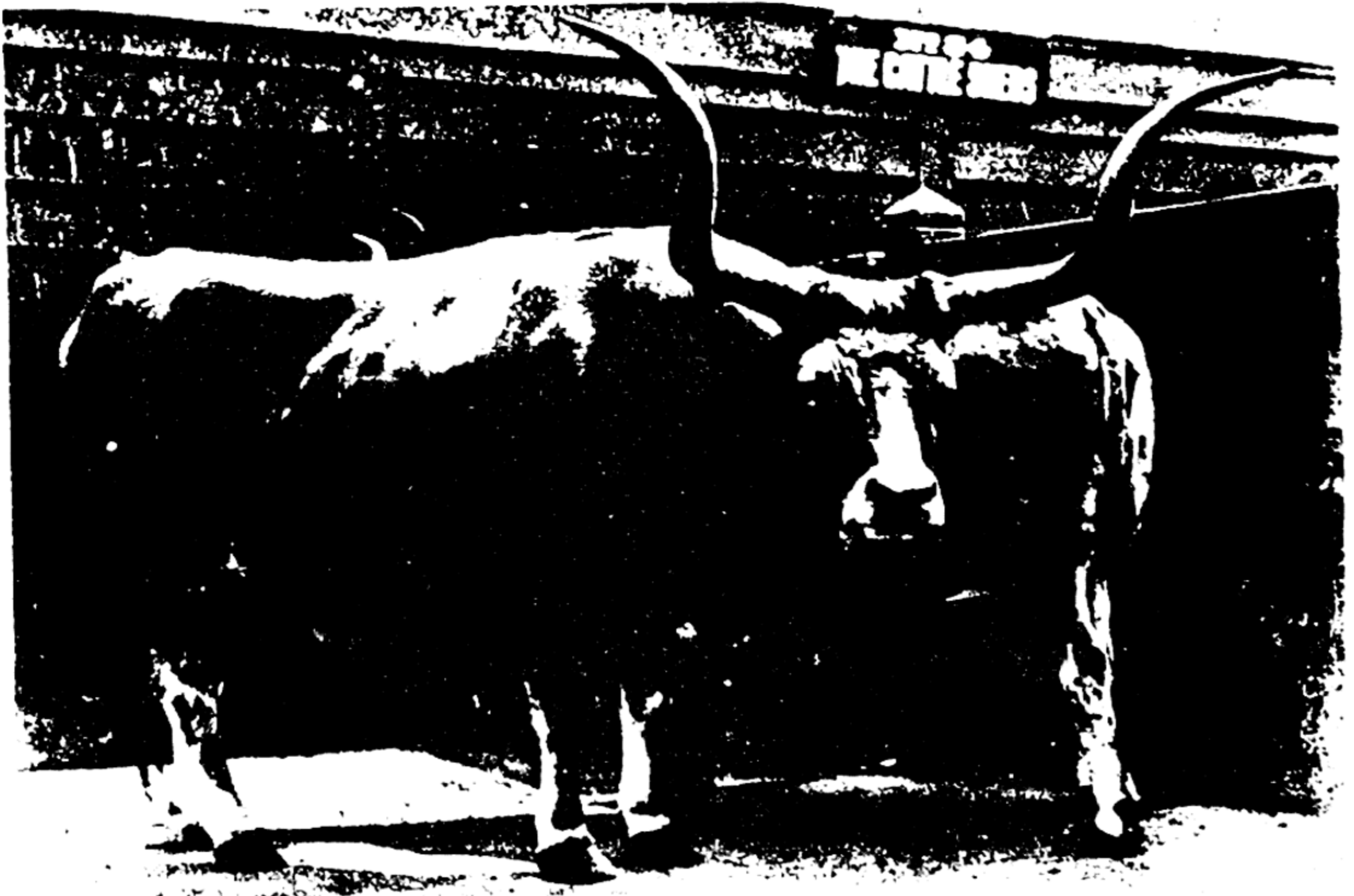
True Ruminants (Tribe *Pecora*). In this tribe there are no incisor teeth in the upper jaw ; the canines of the lower jaw lie alongside the incisors and resemble them in structure and function. The feet are unguligrade, the hoofs of the third and fourth digits alone resting on the ground and having their inner surfaces flattened so that they fit together to form the so-called "cloven hoof," and the two long bones (metacarpals and metatarsals) lying respectively between the wrist or "knee" and the ankle or "hock," which are raised high off the ground, are fused to form a single "cannon" bone. The stomach is as described above.

This tribe is found all over the world, except Australasia and Madagascar, from the Arctic regions southwards.

There are four families : the *Bovidae* (Cattle, Sheep, Goats, Antelopes and Gazelles) ; the *Antilocapridae* (Prongbuck) ; the *Giraffidae* (Giraffes) ; and the *Cervidae* (Deer).

Cattle, Sheep, Goats, Antelopes and Gazelles (Family *Bovidae*). In this family the horns, present at least in the males, consist of a solid, bony growth from the skull, encased in a sheath of true horn, which is neither branched nor shed and is of continuous growth, like claws or hoofs.

Nearly all the species of this family are found in Europe, Asia and Africa.



[James's Press.]

SPANISH CATTLE (*Bos taurus*).

CATTLE AND THEIR ALLIES



CHARTLEY BULL AND COW (*Bos taurus*).

(F. W. Bond.)

These so-called wild park cattle are descendants of domesticated breeds kept true to the fancied colour by the elimination of calves which revert to the ancestral type in tint. There are no genuinely wild species.

A few only inhabit North America and there is none in South America. It is divided into a large number of intergrading subfamilies, most of which are comprehensively called "Antelopes"; but that term does not symbolize a natural group.

Cattle and their Allies. The Bovine section contains the cattle and their allies. They are mostly large, always heavily-built animals, in which the horns are nearly equally developed in both sexes, are never twisted, and never have pronounced ridges or crests; the tail is long or moderately long, and the skin has no special scent glands. The muzzle is broad and is adapted for grazing.

True Cattle (Bos). Of these there are no genuinely wild species, the so-called wild park cattle of Chillingham, Cadzow, Chartley (formerly) and elsewhere being the descendants of domesticated breeds kept true to the fancied colour by the elimination of calves which revert to the ancestral type in tint. This fancied colour is white, with a black or red rim round the muzzle, black or red ears and sometimes spots of those hues on the legs. They are of considerable historical interest and are greatly prized by their owners. In build they resemble the typical, domesticated breeds of Europe (*Bos taurus*), which have no hump on the shoulder, and the croup high and in line with the back. There is little doubt that the

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MYSORE BULL (*Bos indicus* var.), INDIA.

ancestor of these breeds was the Aurochs or Urus (*Bos primigenius*), a huge wild bull which inhabited the forests of Europe and became extinct as a wild animal in the sixteenth century, or perhaps a little later.

Humped Cattle or Zebu (*Bos indicus*), originally known from India, whence they have been exported to many tropical countries, are probably also descended from the Aurochs, although more altered

from that type than our cattle. There are many breeds of them; but they all differ typically from European breeds in having a fatty hump on the shoulder and the croup sloping.

Of the wild species the two most nearly akin to the domesticated breeds just described are the Gaur (*Bibos frontalis*) and the Banteng (*B. banting*). They are, however, distinguished by their shorter tails, "white-stockinged" legs and the elevation of the withers, especially in the bulls.

Gaur. This is often called the "Bison" by sportsmen, and is, perhaps, the handsomest of all wild cattle. The coat is sleek and brownish in hue; the forehead is hairy and typically arched between the horns, which are massive and curved, and the withers are so elevated that the bull may surpass six feet in height, the cow being about a foot shorter. Gaur are found in India, but not in Ceylon, in Indo-China, Burma and the Malay Peninsula, where they are called Seladang. They live, as a rule, in small



[Photos]

GAYAL

[W. S. Berridge.

This is a tame or semi-wild form of the Gaur, being formerly regarded as a distinct species. It is found in India, Assam and adjoining countries.

GAYAL—BANTENG—BISON

herds both in the plains and hills, ascending the latter to a height of six thousand feet in warmer districts. Despite their size, they are shy of man, although dangerous when wounded.

In Assam and adjoining countries there is a tame or semi-wild form, the *Gayal* or *Mithan*, which usually has a flat forehead, and was

formerly regarded as a distinct species. It is, however, almost certainly a domesticated race of the Gaur which in places has run wild.

Banteng or *Tsaine*. This differs from the Gaur in being smaller, having a larger dewlap, a longer tail, a white patch on the buttocks and the area between the horns in the bulls naked and roughened. The colour varies from pale brown in cows and young bulls to nearly black in old bulls. The height is from five to five and a half feet, the withers not being so elevated. It ranges from Indo-China to Java and Borneo, and, in the last two countries at least, is domesticated by the natives.

Bison. The true Bisons have the withers elevated as in the Gaur; but the hair, at least of the head and neck, is developed into a mane and on the rest of the body is thick and woolly in the winter; the horns are short



BANTENG (*Bibos banteng*).

This wild species is distinguished from the domesticated Humped Cattle by its shorter tail, "white-stockinged" legs and the elevation of the withers.



Photos]

HUMPED CATTLE OR ZERU (*Bos indicus*).

These differ typically from European breeds in having a fatty hump on the shoulder and the croup sloping.

(W. S. Barfield)

MAMMALIA (SUBORDER RUMINANTIA)

and there are fourteen pairs of ribs instead of thirteen as in the Gaur and domesticated cattle. There are two species, the European (*B. bonasus*) and the American (*B. bison*), both being uniformly brown in colour.

The European Bison or Wisent, sometimes but wrongly called the Aurochs, is the larger of the two, has the mane less well developed and the hind quarters considerably higher, thus approaching the Gaur, which it rivals in size, a bull standing about six feet high, and weighing up to about two thousand pounds.

The species is now nearly extinct. A few still survive, it is said, under strict protection in the forests of Lithuania; and there are one or two herds in the Caucasus, otherwise the species is represented by examples in Zoological Gardens or private parks like the Duke of Bedford's at Woburn.

The American Bison, called Buffalo in the States, has a more voluminous and extensive



YAK (*Poephagus grunniens*).

[W. S. Berridge.

The colour of the wild animal is deep brown, the height from five to five and a half feet and the weight up to one thousand two hundred pounds.

ous and extensive mane, a more sloping croup, and carries its head lower than the European. The height does not exceed five and three-quarter feet, but the weight may be over two thousand pounds.

In times gone by this Bison lived in vast herds in the prairies of North America to the east of the Rockies. Its extermination started by wholesale slaughter by the Indians as soon as they

got horses from European settlers, and was nearly completed by the latter before measures were taken to protect the few that remained in the Yellowstone Park and in Canada, where there is now a flourishing herd. It has never been domesticated, but when crossed with imported cattle, it produces a fertile hybrid, the Cattalo.

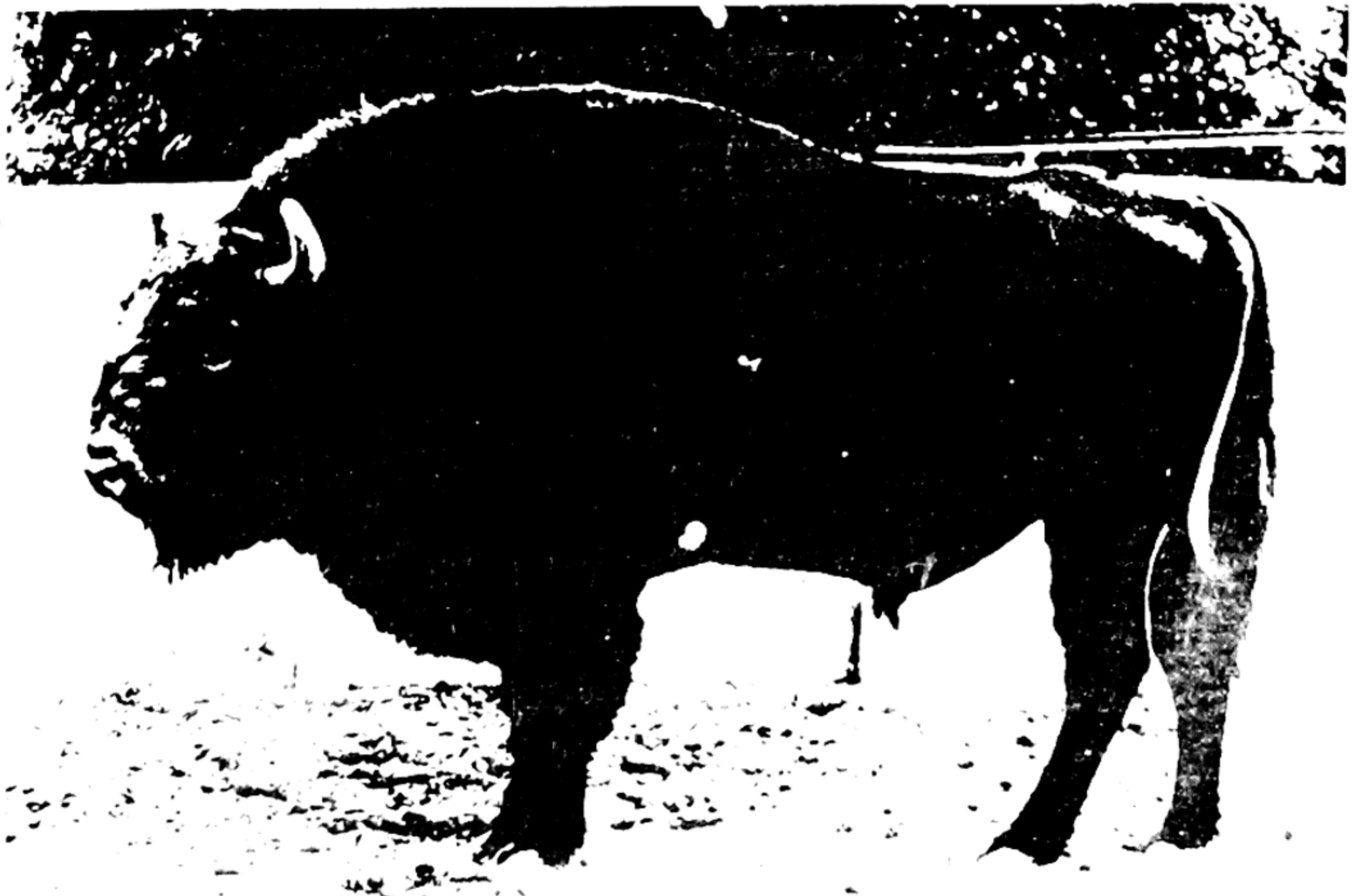
Yak (Poephagus grunniens). The Yak, with the same number of ribs as the Bisons and elevated withers, is a relatively long-bodied, short-legged species, with a thick fringe-like mane on the throat and belly, a long, thick tuft on the tail, and long horns. The colour of the wild animal is deep brown, the height from five to five and a half feet and the weight up to one thousand two hundred pounds. Its natural home is the high plateau and mountains of Tibet and Western China, where it ascends the mountains to a height of 15,000 or 20,000 feet in summer. It is very hardy and surefooted, and was domesticated generations ago by the natives for its flesh, milk, and as a beast of burden. The tame animal is smaller, variously coloured, and the cows are often hornless.



By courtesy of)

AMERICAN BISON (*Bison bison*).

[Canadian Pacific Railways.



[D. Sack-Smith.

EUROPEAN BISON OR WISENT (*Bison bonasus*).

The European Bison is larger than the American, has the mane less well developed and the hind quarters considerably higher. The species is now nearly extinct.

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Buffaloes. The cattle, hitherto described, have the horns circular or oval in section, and the wild species will cross with European domesticated breeds; but in the Buffaloes the horns are typically flattened in front, at least basally, and are more or less triangular in section. These animals have never been known to breed with domesticated cattle. There are two distinct groups of them.

African Buffaloes (Syncerus caffer). These have shorter heads, larger, fringed ears, and the hairs along the spine directed backwards.

They are found in suitable localities all over Africa south of the Sahara and are represented by many local races, the extreme modifications being so distinct that they were regarded as separate species. The typical race, known as the Cape Buffalo, is black, stands about five feet high, and the



[W. S. Berridge.

AFRICAN DWARF BUFFALO (*Syncerus caffer*).

There are many local races found in open bush country, generally near rivers, all over Africa south of the Sahara.

horns, which are close together on the summit of the head, where they form a helmet-like mass, curve at first downwards and backwards close to the ears, then upwards. It inhabits the open bush country, generally near rivers in South Africa, and is represented by nearly-related races in similar districts in East Africa. It is considered by

sportsmen to be one of the most dangerous of the big game animals of Africa.

Dwarf Buffalo. This is a very distinct race, and is sometimes called the Bush Cow. It inhabits the Congo forest area, and is considerably smaller than the African Buffaloes, its height being only about three and a half feet. It is typically red, although bulls, at least, turn black with advancing years; its horns also are smaller, hardly expanded at the base and not curved downwards above the ears. But between these two extremes there appear to be races intermediate in size, colour and horn development.

Asiatic Buffaloes. In these the head is relatively longer, the ears are smaller and unfringed and the hairs along the spine are directed forwards. There are three distinct species. The Common Indian Buffalo (*Anoa bubalis*) is a big beast, bulls being from five to five and a half feet high and

BUFFALOES



"WATER-BUFFALO" (*Anoa bubalis*).
Bulls are from five to five and a half feet high and usually black in colour. These buffaloes live in herds, usually in swampy districts.

usually black. The horns project laterally from the sides of the forehead, where they are widely separated, and may be of immense length, the span from tip to tip being as much as eight or nine feet. These buffaloes live in herds, usually in swampy districts and from their habit of mud-wallowing and lying for hours immersed, only the head above the sur-

face, are frequently called "Water-buffaloes." They are courageous animals with little fear of man and when banded together will attack and kill tigers. The period of gestation is ten months. This buffalo was domesticated generations ago. It is used for draught purposes and milk, and has been introduced into many countries, including Italy and Australia.

Tamarau or Philippine Buffalo (*A. mindorensis*). This is a smaller species, standing about three and a half feet high, and has short, massive horns growing backwards from the forehead and almost in contact at the base. In a great measure it connects the big Indian Buffalo with the typical Anoa (*A. depressicornis*) of Celebes, a still smaller and more lightly-built species, a little over three feet in height, but with the thinner horns growing backwards in the same way. This little buffalo is of particular interest because it links the cattle with the next group of the family, the Tragelaphine antelopes, particularly the Elands, evidence of this kinship being seen externally in the direction of the horns, their presence in both sexes,



Photos] ANOA (*A. depressicornis*).
A lightly-built little buffalo, a little over three feet in height. It is interesting because it links the cattle with the Tragelaphine antelopes.

[W. S. Berridge.

MAMMALIA (SUBORDER RUMINANTIA)



By courtesy of]

[Field Museum of Natural History, Chicago.

BONGO (*Boöcerus eurycerus*).

The Bongo is four feet high, chestnut in colour with about twelve white stripes. It lives in the forested districts of Central Africa.

the tufted, or "bovine" tail and in the presence in some specimens of white patches above the hoofs, two white spots on the cheeks and a white bar low down on the throat, marks which are known as "tragelaphine" from their prevalence in these antelopes.

Tragelaphines. This group contains a large number of species with hardly a single invariable character in common except some of the "tragelaphine" markings above referred to; but the horns are never provided with knobs, are usually spirally twisted and keeled in front, and the feet, as in cattle, never have glands opening just above the hoofs. The group is found in Africa and India.

Elands (*Taurotragus*). These are the largest of the group and differ from cattle in having the horns spirally twisted, like a gimlet, and glands between the lateral hoofs of the hind feet. Bulls have a mat of hair on the forehead.

There are two species. The Common Eland (*T. oryx*) is brighter or paler fawn, with the neck the same colour as the body; the ears are narrow and the dewlap begins on the throat. A large bull stands nearly six feet in height and weighs about one thousand two hundred pounds. This Eland ranges from Kenya Colony to South Africa and Angola. East African specimens which inhabit bush country are brighter in colour and have a few white stripes on the body; but in the Kalahari the colour is dun unrelieved by stripes.

Lord Derby's Eland (*T. derbianus*) is distinguished by its reddish colour, more numerous white stripes, blackish neck and larger ears and the dew-



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen.

ELAND (*Taurotragus oryx*).

A large bull stands nearly six feet in height and weighs about twelve hundred pounds.

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lap beginning at the chin. It inhabits more wooded country than the Common Eland and ranges from Senegambia to the Soudan and Portuguese Guinea.

Bongo (*Boöccercus eurycerus*). This animal is nearly allied to the Elands,



but has no dewlap or frontal mat, and the massive horns have an open spiral of about one complete twist. It is four feet high, is chestnut in colour, with many white stripes (usually about twelve), and lives in the forested districts of Central Africa.

Kudus (*Strepsiceros*). These are distinguished from the preceding by having the tail uniformly hairy, by the horns being absent in the female and forming an open corkscrew spiral in the male. There are two species. The Greater Kudu (*S. strepsiceros*) is the handsomest of all antelopes. The height is close upon five feet, the colour greyish-brown, with white stripes on the body, and there is a long fringe on the throat. It ranges

[F. W. Bond.
YOUNG FEMALE LESSER KUDU (*Strepsiceros imberbis*).
The Lesser Kudu, only about three feet in height, is restricted to Somaliland and Kenya.

from Abyssinia to South Africa, and usually frequents wooded hill-sides.

The Lesser Kudu (*S. imberbis*), restricted to Somaliland and Kenya, is only about three feet in height and has no throat-fringe.

Bush-bucks (*Tragelaphus*). These are the most plentiful of all the group, and differ from the Kudus in their less-twisted horns. The largest is the Mountain, or Buxton's, Bush-buck (*T. buxtoni*), which is about four

NYALA —BUSH-BUCK—MARSH-BUCK

and a half feet high, brownish in colour, with hardly a trace of stripes, and inhabits the mountains to the south of Abyssinia.

Nyala (*T. angasi*). This differs sexually in colour, the male being slate-grey, with a white spinal crest and a fringe on the throat and belly, the female bright red, with white stripes and no fringe. The height is about three and a half feet. This species is found in Zululand, and adjoining countries and



[W. S. Berridge.

MARSH-BUCK (*Limnotragus spekii*).

This antelope is semi-aquatic, frequenting red beds in Central Africa, and often lying immersed in water, with only the nostrils above the surface.



[E. Schneider.

NYALA (*Tragelaphus angasi*).

The male is slate-grey, with a white spinal crest and a fringe on the throat and belly; the female bright red, with white stripes and no fringe.

frequents jungles along river banks.

The smallest species, the Common Bush-buck (*T. scriptus*), which is from two and a half to three feet high, is found nearly all over Africa south of the Sahara, some two dozen local races being distinguished, the handsomest being the *Harnessed Antelope*, in which both sexes are red, with white stripes.

Marsh-bucks, or *Situtungas*, (*Limnotragus spekii*) differ from the Bush-bucks in having the feet very long, with

MAMMALIA (SUBORDER RUMINANTIA)



[W. S. Berridge.
NYLGHAIE (*Boselaphus tragocamelus*).
 This big and ungainly antelope is common in Central India,
 but is not found in Ceylon.

the hoofs widely separable, an adaptation for walking on muddy banks. The height is about four feet. This antelope is semi-aquatic, frequenting reed beds in Central Africa and often lying immersed in water, with only the nostrils above the surface.

There are two Tragelaphines in India, the Nylghaie and the Four-horned Antelope. They differ from the African species in having a gland in front of the eye and the horns, present only in males, not spirally twisted.

Nylghaie, or *Blue Bull*, (*Boselaphus tragocamelus*). This big and ungainly antelope, about four and a half feet high, has a mane on the neck and the

tail fringed. In the male the colour is iron-grey, the throat is tufted and the horns are short, curved spikes. The female is fawn and has no throat-tuft. Common in Central India but not found in Ceylon, the Nylghaie occurs in small herds in the plains or low hills covered with thin bush.

Four-horned Antelope (*Tetracerus quadricornis*). This takes its name from the usual presence of a pair of additional small horns in front of the ordinary pair, which are short spikes. It is a small antelope of India, about two feet in height, is reddish fawn in colour, and lives mostly in bush or thin forest, but is not gregarious.

Kobines. This group, containing the Water-bucks, Kobs and Reed-bucks of Africa, is related in some respects to the Tragelaphines, but the horns, present only in males, are untwisted, typically



[By courtesy of] [Carl Hagenbeck's Tierpark, Stellingen
DEFASSA WATER-BUCK (*Kobus defassa*).
 This is also known as the Sing-sing; its range embraces parts of
 West as well as East Africa.

KOBINES—WATER-BUCKS—KOBES

lightly curved and strengthened by thick transverse ridges.

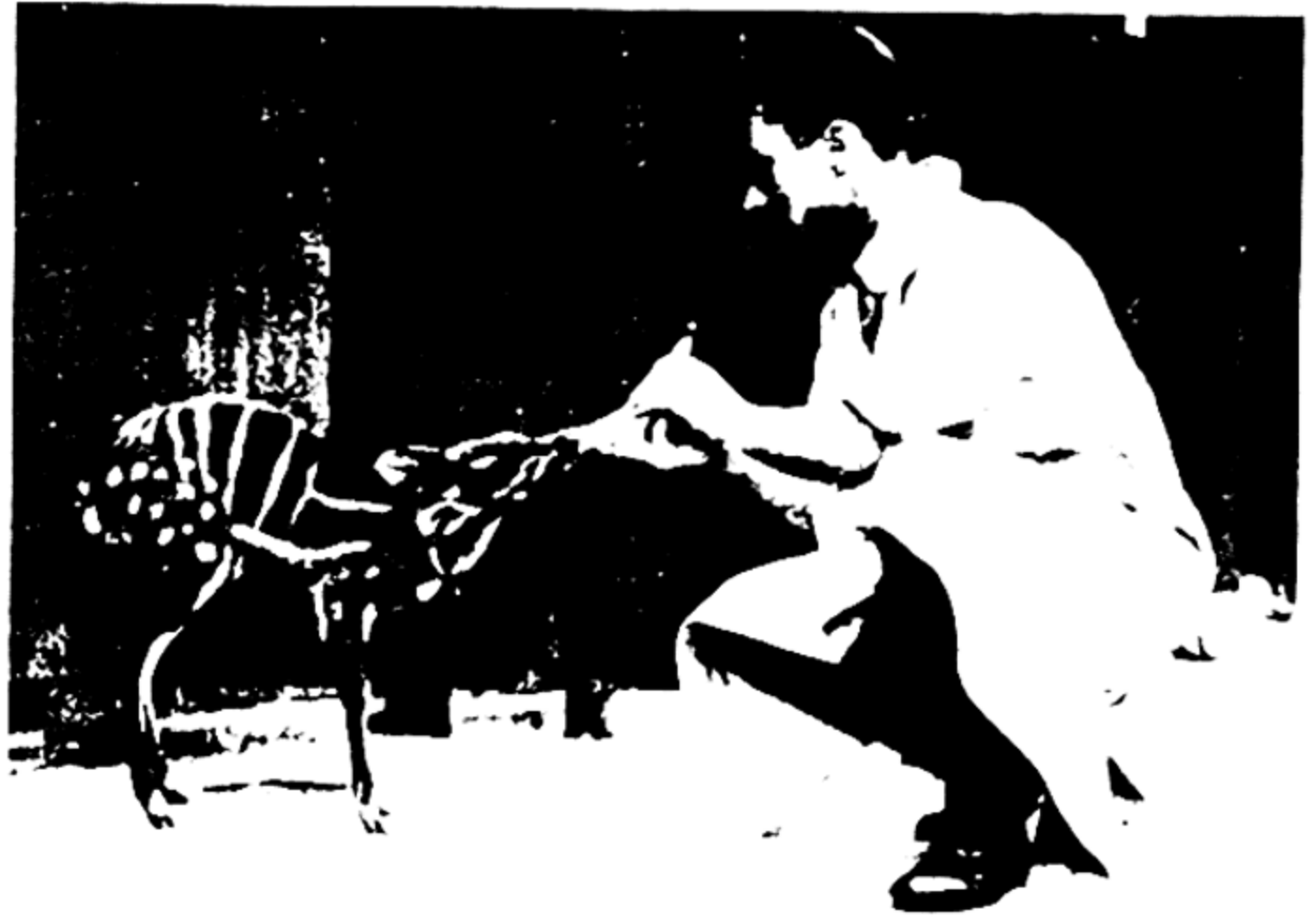
Water-bucks. The largest species are the typical so-called Water-bucks (*Kobus ellipsiprymnus* and *K. defassa*), in which the height is over four feet. The former, distinguishable by the white ring on the rump, set off by the dark brown hue of the body, inhabits the plains and hills of

East Africa as far south as the Zambesi. The other, known as the Singing, has no rump-ring, is usually paler and has a wider range, which embraces parts of West as well as East Africa.

The term "Water-buck" is inappropriate for these two antelopes, but is more suitable for two related species, the typical Lechwe (*K. leche*), which is typically fawn in colour and frequents swampy districts of the Zambesi,

and to Gray's Lechwe (*K. megaceros*), which is about the same size, over three feet high, dark brown in colour, with a white patch on the back of the neck, and lives in the swamps of the Upper Nile. The Kobs (*Kobus kob*) resemble the large Water-bucks in habits, but are much smaller, about three feet high, are mostly fawn in colour, and are widely distributed.

The Reed-bucks or Riet-boks (*Redunca arundinacea*, etc.), also



[W. S. Berridge.
YOUNG HARNESSED ANTELOPE.
Both sexes are red with white stripes.



[James's Press.
HARNESSED ANTELOPE.
(*Tragelaphus scriptus*).

This is the handsomest of the Common Bush-bucks, of which there are some two dozen local races.

MAMMALIA (SUBORDER RUMINANTIA)

widely distributed, and of medium size, differ from the foregoing in having the tail bushy, not tufted. The Vaal-rhebok (*Pelea capreolus*), with a similar tail, but greyish in tint and only two and a half feet high, is the most primitive type of this section, the horns being simple, straight spikes. Its habitat is rocky hills of South Africa.

Aepycerines. This group contains the Impala or Palla (*Aepyceros melampus*) and is distinguished from the preceding by the absence of lateral hoofs and by the presence of a pair of glands, covered with black hair, above the fetlocks of the hind legs. The horns, absent in the female, are long, lyrate and knobbed; the colour is reddish-brown and the height over three feet. This elegant antelope lives in the bush country of East and South Africa.



[W. S. Berridge.

WHITE-TAILED GNU (*Connocchaetes gnou*).
This is rather like a small buffalo, brown in colour, with a white, bushy tail. It is now probably extinct as a wild animal.

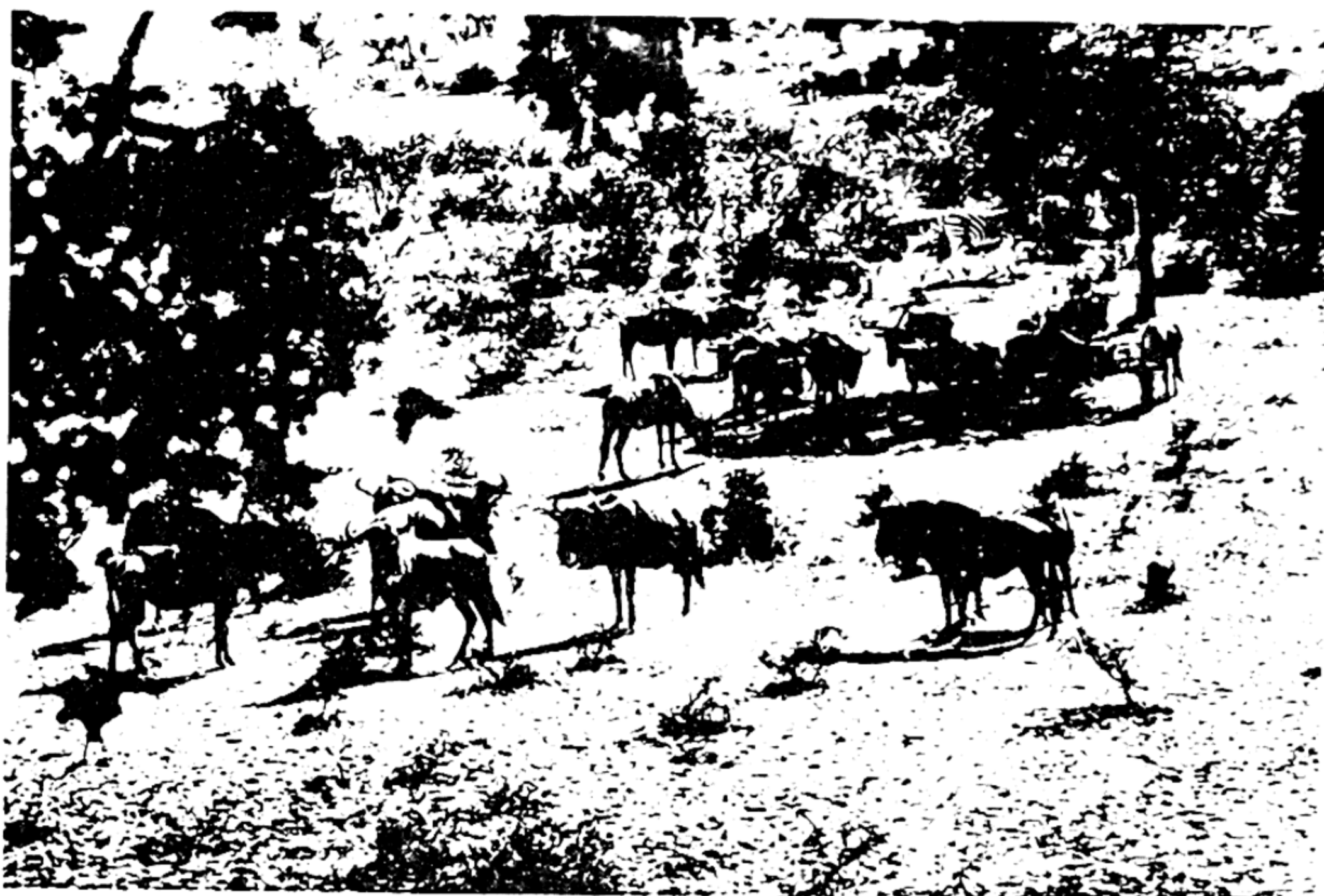
Bubalines. This group contains the Hartebeests and Wildebeests or Gnus, large African antelopes with long faces, swollen muzzles, valvular, hairy nostrils, large pocket-like glands on the fore feet and horns of equal size in both sexes. They are gregarious and live in the open plains of Africa.

Wildebeests or Gnus. These have the horns unridged and directed downwards then up-

wards; the muzzle is very broad, the face coarsely hairy and the neck maned. There are two kinds; the White-tailed Gnu, or Black Wildebeest, (*Connocchaetes gnou*) is brown, with a white, bushy tail, a high croup and horns bent sharply down before curving upwards. It is a savage-looking animal, rather like a small buffalo, and standing 4 feet high. It was formerly abundant on the flats of South Africa, but is now probably extinct as a wild animal.

The Brindled Gnu or Blue Wildebeest (*Gorgon taurinus*) is a larger antelope, nearly four and a half feet high, and greyish in colour, brindled with brown stripes on the neck and forequarters, the tail being black. It has a wide range, from Kenya to the Zambesi and Angola.

Hartebeests. In these animals the horns are ridged and directed upwards, the face is smooth and the neck without a mane.



GNU OR BLUE WILDEBEEST (*Gorgon taurinus*)

There are two kinds of Gnu, the White-tailed Gnu, or Black Wildebeest, and the Brindled Gnu, or Blue Wildebeest, somewhat larger, nearly four and a half feet in height.



Photos by courtesy of]

IMPALA OR PALLA (*Aepyceros melampus*)

[South African Railways.

The height of this elegant antelope is over three feet, the colour being reddish brown. Habitat, bush country of East and South Africa.

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The typical Hartebeests (*Bubalis*) have long, narrow faces and the horns, which are raised on an eminence, exhibit a sharp angular bend before the point. There are a great many species, differing in colour, the shapes of the horns, etc., and the range covers practically the whole of Africa. The most northerly form, the Bubal (*B. buselaphus*), inhabiting Morocco and Tunis, is a pale fawn in colour and about three and a half feet high. The

most southerly, the Kaama (*B. caama*), from Cape Colony, is reddish-brown, with the face mostly black, the height being about four feet.

A different type of Hartebeest (*Damaliscus*) has a shorter face, the horns not elevated and without the angular bend. The earliest-



[W. S. Berridge.

BLESBOK (*Damaliscus albifrons*).

This Hartebeest is brownish, with a white blaze on the face. It stands about three feet in height.



[F. W. Hind.

ARABIAN ORYX (*Oryx leucoryx*).

In these large antelopes the straight, spike-like horns are present in both sexes.

known kinds were the Bontebok (*D. pygargus*) and the Blesbok (*D. albifrons*), which are about three feet high and brownish, with a white blaze on the face. The Bontebok, distinguished by its white rump, is now represented by a single herd preserved to the south of Cape Town; the Blesbok, by a few protected herds north of the Orange River. Related species without any white and a little larger range through East Africa



YOUNG GEMSBOK (*Oryx gazella*).
The Gemsbok is found only in South Africa.



[Photos]

[W. S. Herridge]

BONTEBOK (*Damaliscus pygargus*).
This Hartebeest is distinguished by its white rump, and is now represented by a single herd preserved to the south of Cape Town

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to Senegambia, the Sassaby (*D. lunatus*) being found in Mashonaland; the Tiang (*D. korrigum*) ranging from Kenya Colony westwards, the Topi Antelope (*D. korrigum topi*) occurring in Uganda, and Hunter's Hartebeest (*D. hunteri*) inhabiting Jubaland.

Gazellines. This group is nearly akin to the last, but has the face shorter, the muzzle narrower, a pocket-like instead of a nearly solid facial gland and large glandular clefts on the hind, as well as on the fore feet. The horns of the male are like the Blesbok's, but in the female they are small or absent. These antelopes live in open, often desert country, are mostly of medium or small size and have slender legs.



GRANT'S GAZELLE (*Gazella granti*) AND EAST AFRICAN ORYX (*Oryx beisa*). [Wide World Photos.]

Gazelles. The typical gazelles (*Gazella*) have the horns curving backwards, the neck not unusually long, and conspicuous glandular pads on the knees. There is a great variety of species and races, ranging from central to south-western Asia and thence all over North Africa into British East Africa. Most of them, like the Dorcas Gazelle (*G. dorcas*) of the northern Sahara, and the Arabian Gazelle (*G. arabica*) of Arabia, are very much alike, being generally sandy-brown in colour, with black and white bands on the face and usually on the flanks and buttocks. They are of small size, the height being about two feet. Much larger species, very variable locally in colour, are Soemmering's Gazelle (*G. soemmeringi*) from the deserts near

GAZELLES—BLACK-BUCK—SPRINGBOK

Abyssinia, and the Mhor Gazelle (*G. dama*) from Morocco, Gambia and the Soudan, in which the height is about three feet. Nearly as large and remarkable for the great length of the horns is Grant's Gazelle (*G. granti*) from British East Africa.

Black-buck (*Antelope cervicapra*). This differs from the gazelles in having the horns spirally twisted and in the colour-contrast between the sexes, the



BLACK-BUCK OR INDIAN ANTELOPE (*Antelope cervicapra*).
The females are fawn and the males assume a black livery in the breeding season.



Photos]

[W. S. Berridge.

SPRINGBOK (*Antidorcas marsupialis*).
The height of this little gazelle is about two and a half feet.

females being fawn and the males assuming a black livery in the breeding season. The height is about two and a half feet. It inhabits the plains of central and north-western India.

Springbok (*Antidorcas marsupialis*). This resembles the typical gazelle in its horns, shape and colouring, but differs in having a large white dilatable patch of glandular skin on the hinder part of the back and no knee pads. The height is about two and a half feet. This antelope replaces

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GAMBIAN ORIHU ANTELOPE.

[James's Press.]

the gazelles in Africa, south of the Zambesi, where it periodically migrates in vast hordes.

Gerenuk. An aberrant member of this section is the Gerenuk, or Waller's Gazelle, (*Lithocranius walleri*), which is remarkable for the extreme length of its neck and legs and small but extraordinarily heavy head, whence its name meaning "stone-headed." The height is about three and a quarter feet and

the species occur in Somaliland and British East Africa.

Africa is also the home of large numbers of familiar small or medium-sized antelopes with short, spike-like horns, a scent gland between the digits, and usually in front of the eyes. They represent several distinct groups.

Duikers. The Cephalophine group, containing the Duikers, is distinguished from all antelopes by the ducts of the face-glands opening by a series of pores. There is a large number of species spread all over central and southern Africa, differing greatly in colour and size. One of the largest, Jentink's



COMMON DUIKER ANTELOPE.

[W. S. Berridge.]

The name "duiker," meaning diver, is given to these antelopes because of their manner of plunging into the undergrowth.



THE EDMI OR CUVIER'S GAZELLE (*Gazella cuvieri*) FOUND IN N W. AFRICA. [James's Press.]

MAMMALIA (SUBORDER RUMINANTIA)



[W. S. Berridge.

ADDAX ANTELOPE.

This antelope, with long and spirally-twisted horns, inhabits the desert regions of Northern Africa.

Duiker (*Cephalophus jentinki*), which inhabits Liberia, is two and a half feet high and whitish on the body, black on the head and neck. The Blue Duiker (*C. monticola*), of South Africa, is about one foot high, and greyish-brown in colour. The name "duiker," meaning diver, is given to these antelopes because of their manner of plunging into the undergrowth.

Oribis. The Neotragine group, of which the Oribis (*Ourebia*) are the best-known representatives, differs from the Duiker group in having the pores of the face-glands scattered and typically sunk in a pocket. The Oribis, of which there are many species, are the largest, standing about one and a half feet in height, and are fawn in colour, with a patch of bare skin under the ear and tufts on the knees. The common Oribi (*O. ourebi*), of Cape Colony, and the Black-tailed Oribi (*O. nigricaudata*), of



[F. W. Bond.

EAST AFRICAN BOHOR REEDBUCK (*Redunca redunca*).

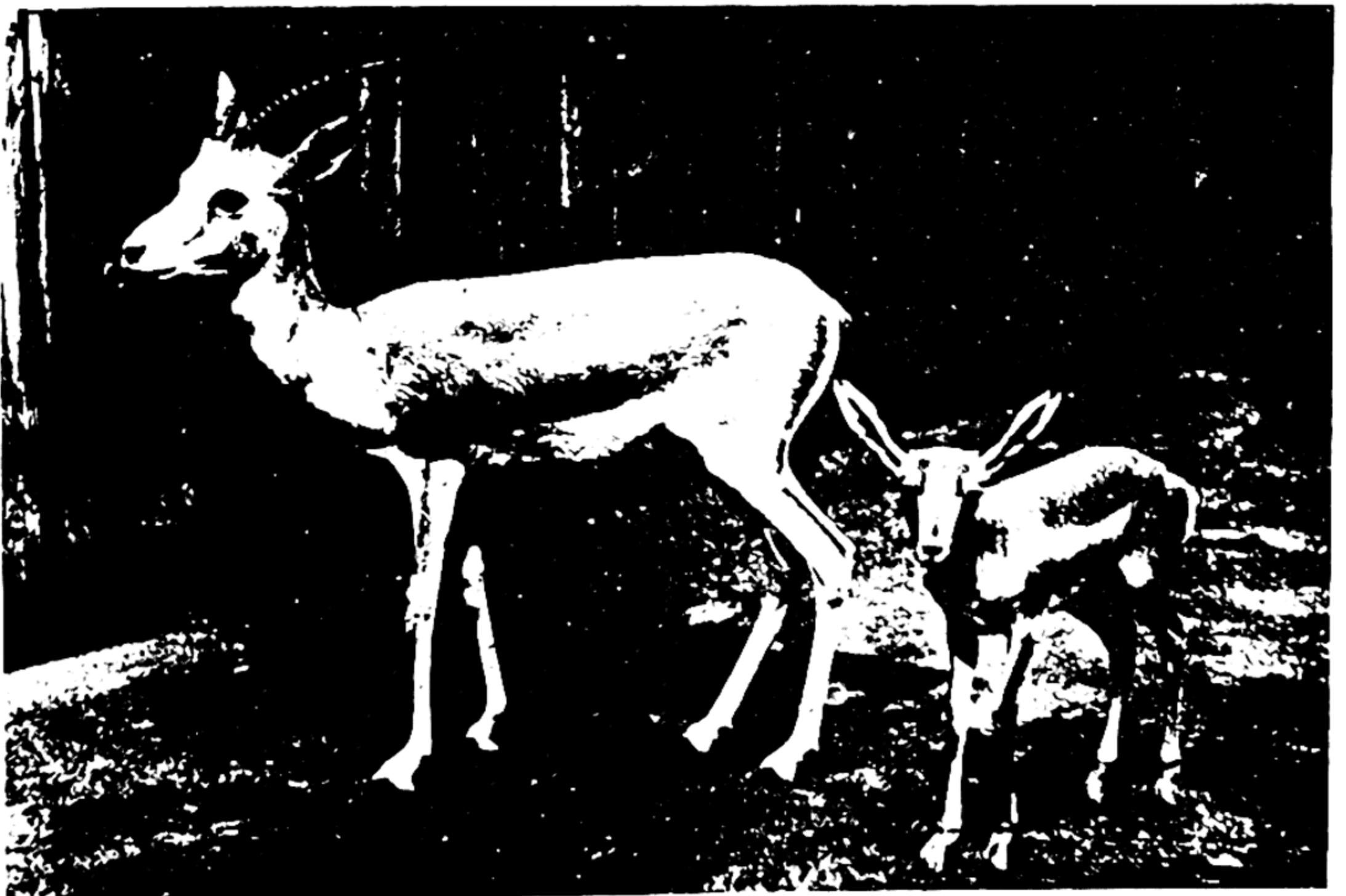


By courtesy of]

[Richard T. Doernor, Philadelphia, and the Academy of Natural Sciences of Philadelphia, U.S.A. (founded 1812).

SABLE ANTELOPES.

Both male and female carry horns, which in the male may reach a length of over sixty inches. These antelopes are usually found in herds of from one to two dozen



WHITE-FACED GAZELLE (*Gazella marica*).
This gazelle inhabits the desert regions of S. Arabia.

(W. S. Berridge.

MAMMALIA (SUBORDER RUMINANTIA)



GRYSBOK (*Nototragus melanotis*).

The colour of this little animal is rich red, sprinkled with white hairs. It inhabits Cape Colony.

Senegambia are examples.

Grysbok (*Nototragus melanotis*). This animal of Cape Colony, differs from the Oribis in having no patch below the ear and no knee pads. The colour is rich red, sprinkled with white hairs. The Steinbok (*Raphicerus campestris*), also found in Cape Colony, differs from the Grysbok in having no lateral hoofs. The Royal Antelope (*Neotragus*

pygmaeus), inhabiting Guinea, differs from the preceding in having the horns, which are only one inch long, inclined backwards. This antelope, which is reddish-fawn in colour, is the smallest of all antelopes, standing only ten inches high.

Klipspringers. The Oreotragine group contains only the Klipspringer (*Oreotragus oreotragus*), which is probably related to the foregoing, but is distinguished by its harsh, pithy coat, the absence of foot-glands, and the structure of the hoofs, which, instead of being pointed, are blunt at the end, the animal walking upon the extreme tips, with the heels elevated. By means of its feet, this antelope is able



[Photos]

KLIPSPRINGER (*Oreotragus oreotragus*).

The hoofs, instead of being pointed, are blunt at the end, and the animal walks upon the extreme tips, with the heels elevated. It is thus able to climb about the rocky precipices of the mountains, where there is apparently no foothold.

[W. S. Berridge.]

KLIPSPRINGER—DIK-DIK—CHIRU

to climb about the rocky precipices of the mountains it frequents, where there is apparently no foothold. It is brownish or yellowish in colour, a little over one and a half feet in height, and ranges from Nigeria to Abyssinia and Cape Colony.

Dik-diks. The Madoquine group, popularly known as Dik-diks, are elegant little antelopes, differing principally from the Oribi group in the structure of the muzzle, which forms a thick-

ened kind of proboscis, clothed with hair to the very edge of the nostrils. There are many species, ranging from Abyssinia to Cape Colony, Salt's Dik-dik (*Madoqua saltiana*), from Abyssinia, and the South African Dik-dik



[W. S. Berridge.
PIGMY OR ROYAL ANTELOPE (*Neotragus pygmaeus*).
This antelope, which is reddish-fawn in colour, is the smallest of all antelopes, standing only ten inches in height.



[Wide World Photos.
YOUNG DIK-DIK ANTELOPE (*Rhynchotragus*).
In these elegant little antelopes, the muzzle forms a thickened kind of proboscis clothed with hair to the very edge of the nostrils.

(*Rhynchotragus damarensis*), both about fourteen inches high, being representatives. The Beira (*Dorcotragus megalotis*), inhabiting Somaliland, is a specially - modified type with short hoofs, like those of a goat, adapted for rock climbing.

Chiru and Saiga. In Central Asia there are two aberrant antelopes, each the representative of a special group. The Pantholopine group contains the Chiru

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(*Pantholops hodgsoni*), which differs from the gazelles with which it was formerly classified by the absence of face-glands and foot-glands, its compact sheep-like feet, inflated nostrils and other characters. The horns, present only in the males, are long, erect and strongly ribbed ; the coat is coarse and close, the tail short, the colour fawn and the height a little over two and a half feet. This antelope lives in herds to the north of the Himalayas in Tibet, up to an altitude of 18,000 feet.



DAMA GAZELLE (*Gazella dama*).

[W. S. Berridge.

The Saiga (*Saiga tatarica*), the only representative of the Saigine group, is distinguished by the immense inflation of the nose into a proboscis with the nostrils opening downwards ; the horns are erect, ridged and amber-coloured as in some sheep. The animal has other sheep-like characters and seems, in a measure, to connect the group with the gazelles. The colour is yellowish in the summer, whitish in winter, and the height is about two and a half feet. The Saiga inhabits the steppes of South Russia and western and Central Asia.

CHAMOIS—GORALS AND SEROWS

Chamois. The Rupicaprine group, typified by the Chamois, links in a measure the preceding Gazelline with the following Caprine section, but differs from both in having the horns equally well-developed in both sexes, generally smooth and never ridged. In other respects the genera vary greatly. They inhabit mountainous districts of Europe, Asia and North America.



CHAMOIS.

The Chamois is found at high altitudes in the principal mountain ranges of Europe, from the Pyrenees to the Caucasus, and also in Asia Minor.

The Chamois (*Rupicapra rupicapra*), has the horns short, vertical and hooked at the tip. There is a well-developed gland on the head, just behind them, which becomes greatly swollen in the rutting season in the males. The general colour is brown and the height about two and a half

feet. The Chamois is found at high altitudes in the principal mountain ranges of Europe, from the Pyrenees to the Caucasus, and also in Asia Minor.



Photos]

[W. S. Berridge.

HIMALAYAN GORAL (*Naemorhedus*).

This is a relation of the Chamois and Takin, differing from the former in having the horns sloped backwards and not hooked.

Gorals and Serows. Differing from the Chamois in having the horns sloped backwards and not hooked, in the absence of the gland on the head, and in the presence of flask- or sac-like glands in the feet, and a naked, moist nose, are the Gorals (*Naemorhedus*) and the Serows (*Capricornis*), found mostly in the

MAMMALIA (SUBORDER RUMINANTIA)



ROCKY MOUNTAIN GOAT (*Oreamnos americanus*).
The white coat is very long and shaggy in winter. This animal ranges through the northern portion of the Rockies from British Columbia to Alaska.

Himalayas and the mountains of China, although the typical Serow (*C. sumatraensis*), which is between three and three and a half feet in height, ranges as far south as Sumatra.

Rocky Mountain Goat (*Oreamnos americanus*). This resembles the Serow in the shape and direction of its horns, but has a head-gland and no definite foot-glands as in the Chamois. The

legs are short below the knees and hocks and the colour is white, the coat being very long and shaggy in the winter. The height is about three and a half feet, and the range is the northern portion of the Rockies from British Columbia to Alaska.

Takin (*Budorcas taxicolor*). The Takin is heavily built, with a low croup and short limbs, as in the Rocky Mountain Goat; but it is distinguished by the horns being thickened at the base and growing outwards, slightly downwards and then upwards at the point. The height is three and a half feet or over. The range is from Bhutan in the Himalayas to Central China. In Bhutan the Takin is brown with a light saddle; but in Shensi in China it is golden-brown all over.

Musk-ox. In the Musk-ox (*Ovibos moschatus*), the horns are an exaggeration of the type



[Photos]

TAKIN (*Budorcas taxicolor*).
The range of this animal is from Bhutan in the Himalayas to Central China.

[W. S. Berridge.

MUSK-OX (OVIBOS MOSCHATUS)

seen in the Takin, being still thicker at the base and growing downwards close to the face before turning upwards at the tip. The build is heavy, the tail very short and the legs are short and strong as in the Takin; but the croup is high and, as a protection against cold, the coat is coarse and shaggy, falling almost to the fetlocks, and the hoofs are broad, with hair projecting



[W. S. Berridge.

HIMALAYAN SEROW, OR GOAT ANTELOPE

(*Capricornis sumatraensis*).

These animals are found mostly in the Himalayas and the mountains of China.

between them, as an aid to crossing slippery snow and icefields. The general colour is brown, and the height about four feet. The scent of musk



By courtesy of)

[Carl Hagenbeck's Tierpark, Stellingen.

MUSK-OX (*Ovibos moschatus*).

The Musk-ox, which is about four feet in height, inhabits north eastern Canada, Greenland and some of the adjoining Arctic Islands.

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from which the animal takes its name is not secreted by any special glands but pervades the flesh and is especially noticeable during the rutting season. The Musk-ox feeds on the sparse, coarse vegetation of the countries it inhabits, namely, north-eastern Canada, Greenland and some of the adjoining Arctic Islands.

Goats and Sheep, Ibexes, Markhors and

Thars (*Caprinae*). These are assigned to the Caprine section, and are not easily definable from the Rupicaprines except by the sexual inequality in the size of the horns, which are well developed in the males and small or absent in the females. The two groups are also alike in inhabiting mountainous districts of the northern hemisphere.



CAUCASIAN IBEX, OR TUR (*Capra caucasica*).
The horns are comparatively short and curve outwards and backwards close to the neck.



Photos]

MARKHOR (*Capra falconeri megaceros*).
The horns are spirally twisted, either like a corkscrew or gimlet.

[W. S. Berridge.

The typical representatives of the section, the Goats and the Sheep, are very distinct from one another; but they are to a greater or less extent linked together by intermediate types, which, according to fancy, may be called by either name.

Goats (Capra). In the Goats, the wild species of which are usually called Ibex, the horns are inclined upwards and backwards and there are no scent glands on the face, groin or feet; but the lower side of the tail is

GOATS—IBEX—TUR



CRETAN IBEX (*Capra hircus*).

This is the wild species from which domesticated goats are descended. It is still found indigenous in Crete.

glandular, and the males have a beard and the characteristic "goaty" odour. They are confined to Europe, North Africa and Central Asia, and are represented by the Ibexes of Spain (*C. pyrenaica*) and the Alps (*C. ibex*) in Europe; of Nubia (*C. nubiana*) and Abyssinia (*C. walie*) in Africa; and of the Caucasus (*C. caucasica*), the Tur; of Asia Minor and Persia (*C. hircus*), the Pasang or Wild-goat; of Central

Asia and the Himalayas (*C. sibirica*); and of Afghanistan, etc. (*C. falconeri*), the Markhors. These species vary considerably in size, colour, curvature and structure of the horns and other characters. Typically, the horns form a bold, nearly semi-circular curve upwards and backwards; but in the last of the list, the Markhor, they are spirally twisted, either like a corkscrew or gimlet. Of special interest as being the wild species from which domesticated goats are descended is the Persian and Asia Minor species, still found indigenous in Crete. One of the smallest species is the Spanish Ibex, about two and a half feet in height; the largest being the Caucasian and Siberian species, which may reach three and a half feet.

Tur (*Capra caucasica*). In some of the Caucasian Ibexes, called Tur, the horns are comparatively



Photos)

HIMALAYAN BHARAL OR BLUE SHEEP (*Pseudois nayaur*). This differs from typical goats in being without a beard and in having no strong odour.

(W. S. Berridge.

MAMMALIA (SUBORDER RUMINANTIA)



"NILGIRI IBEX" (*Hemitragus hylocyrus*).
This is one of the Thars, and inhabits the hills of southern India.

short and curve outwards and backwards close to the neck. In this respect they approach the Bharal (*Pseudois nayaur*), often erroneously called the Blue Sheep, which further differs from typical goats in being without a beard and in having no strong odour. It is grey in colour, with black marks on the legs, is about three feet in height, and inhabits the Himalayas at an average altitude

of about 13,000 feet.

Another species, closely akin to the goats, is the so-called Barbary Sheep or Udad (*Ammotragus lervia*), which has horns very like those of the Bharal and the odour of goats, but is distinguished by a longer tail and a mane of long hair on the throat and upper part of the fore legs. The colour is fawn and the height about three and a quarter feet. It is found in Barbary and Kordofan in North Africa.

Thars (*Hemitragus*). These are beardless goats with short, evenly-curved horns. Their distribution is



NUBIAN GOAT.
The colour of these goats is sometimes black, sometimes brownish-red and spotted.

[Clarke and Hyde.

THARS (HEMITRAGUS)

peculiar in its discontinuity. The typical species (*H. jemlahicus*) is a shaggy-coated animal, brown in colour, about three and a quarter feet high, and found in the Himalayas, the second (*H. hylocrius*), known as the "Nilgiri Ibex," about the size of the last but shorter coated and thicker horned, inhabits the hills of southern India; the third (*H. jayakari*), the smallest of all



(W. S. Berridge.

THAR

(*Hemitragus jemlahicus*).

This beardless goat is shaggy-coated, brown, about three and a quarter feet in height and found in the Himalayas.



(Charles Reid.
BARBARY SHEEP OR UDAD (*Ammotragus lervia*).
This animal, fawn in colour and about three and a quarter feet in height, is found in Barbary and Kordofan in North Africa.

the goats, being only two feet high, is found in south-eastern Arabia.

Sheep (Ovis).

These are distinguished from the rest of the group by having a pair of pocket-glands on the face and groin, flask-like glands in all the feet; no glands on the under side of the tail, and the horns in the rams directed outwards and downwards at the tip and then in nearly all cases forwards on each side of the face, with a marked spiral

MAMMALIA (SUBORDER RUMINANTIA)

twist. Apart from one isolated species in Corsica and Sardinia, they range from Cyprus, Asia Minor and Persia through Central Asia and through the Rocky Mountains in North America.

There are many different kinds, both species and local races, the latter generally restricted to particular mountain ranges. The Mouflon



By courtesy of]

BIGHORN OR ROCKY MOUNTAIN SHEEP (*Ovis canadensis*). [Canadian Pacific Railway.

There are more than a dozen local races, varying in colour from brownish as in the typical race from British Columbia, to white in the Yukon race.

(*O. musimon*) of Sardinia and Corsica is a small species about two and a quarter feet high, dark brown in colour, with a white saddle. The Asiatic species are paler and vary greatly in size and in the massiveness and length of their horns. The Red Sheep (*O. orientalis*), inhabiting Cyprus, Asia Minor and Persia, is the smallest, being only slightly larger than the Mouflon, the points of the horns turning inwards towards the neck. The largest

SHEEP (OVIS)

is the Argali (*O. ammon*), ranging from the northern slopes of the Himalayas to Kamtchatka. It may be as much as four feet high and typically has long, massive horns, curving forwards on each side of the face, and is fawn in colour. The best-known races are the typical form from the Altai, Marco Polo's Sheep (*O. a. poli*) from the Pamirs and Hodgson's Sheep (*O. a. hodgsoni*) from Tibet



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen.

URIAL OR PUNJAB WILD SHEEP (*Ovis vignei*).
This sheep ranges from Sind, the northern Punjab and Persia to Tibet.

and Kashmir. Intermediate between the Red Sheep and Argali in distribution and size, but with the horns curved as in the Argali, is the Urial or Gad (*O. vignei*), which is nearly three feet high and ranges from Sind, the northern Punjab and Persia to Tibet. The Bighorn or Rocky Mountain



HAUSSA OR AFRICAN LONG-TAILED SHEEP.
This domesticated race has a hairy coat like a goat's.

[W. S. Berridge.

Sheep (*O. canadensis*) is smaller than the Argali, the height seldom much exceeding three feet, and has smaller horns. There are more than a dozen local races, varying in colour from brownish as in the typical race from British Columbia to white in the Yukon race.

Domesticated Sheep are probably descended from the Mouflon, with a possible strain of the Red Sheep and the Urial. The fleece has been

MAMMALIA (SUBORDER RUMINANTIA)



(W. S. Herridge.
UNICORN SHEEP FROM NEPAL.
 In this domesticated breed the two horns are
 artificially joined.

goat-like and their general appearance is probably responsible for the view of the existence of hybrids between goats and sheep. There is, however, no evidence of the two interbreeding.



(W. F. Taylor.
FAT-TAILED SHEEP.
 This eastern breed has an accumulation of fat on its long tail.



(W. S. Herridge.
DUMBA OR FAT-RUMPED SHEEP.
 In this breed the fat is on the buttocks.

developed by selective breeding, but there is no explanation of the long tail seen in European breeds, all the wild species having short tails. Some domesticated breeds, however, like the Haussa sheep of West Africa, have short tails and no fleece. Except for the horns they are

Family Antilocapridae (The Prongbuck or Pronghorn.)

The sole representative of this family is the Prongbuck (*Antilocapra americana*), known in the United States as the antelope because it is the only animal resembling an antelope in

DOMESTICATED SHEEP

habits and appearance found in that country. The horns, indeed, resemble those of the antelopes and cattle (*Bovidae*), in consisting of a bony core encased in a horny sheath; but they



[W. S. Berridge.
MERINO SHEEP.
The fleece of this sheep supplies
merino wool.



James's Press.
FOUR-HORNED SHEEP.
In this domesticated breed each horn
is split into two.

between this casting and regrowth of the sheath and the casting and regrowth of the antlers of deer. In the latter the bone itself is shed and redeveloped.

The horns, usually present only in the bucks, rise vertically above the eyes, generally to a height of



[W. S. Berridge.
MOUFLON (*Ovis musimon*).
This wild sheep inhabits Sardinia.

MAMMALIA (SUBORDER RUMINANTIA)

about twelve inches. The tip of the main prong is hooked and the accessory prong projects forwards. The colour is brown above, white on the belly, throat and cheeks ; and there is a conspicuous blaze of erectile hair on the rump, which acts as a guide mark to keep the members of the herd together at night. The tail is quite short and the legs are long and slender. The height is about three feet.

Prongbuck were formerly found in large herds in the prairies of temperate North America, to the west of the Mississippi ; but the species is now on the verge of extinction, owing, apparently, to its susceptibility to a disease known to veterinary surgeons as "fossy-jaw." Its chief enemies, apart from man, are wolves. But there are stories of does, with fawns to defend, killing small prairie wolves by cutting them to pieces with strokes of their sharp hoofs. The fawns, usually two in number, are born in the spring, and until strong enough to follow the doe, lie up in clumps of prickly cactus in clearances made by the mother for their use.



YOUNG PRONGBUCK (*Antilocapra americana*).

[W. S. Berridge.

This animal was formerly found in large herds in the prairies of temperate North America, to the west of the Mississippi, but is now on the verge of extinction.

GIRAFFE (*GIRAFFA CAMELOPARDALIS*)



[Underwood.]

GIRAFFES AND ZEBRAS.

There are several local races of giraffe, differing from each other in pattern and colour. They are found in suitable localities all over Africa, south of the Sahara.

The Family Giraffidae (*Giraffes and Okapi*)

This family is distinguished from the rest of the Pecora by the presence of a deep cleft in the crown of the outer tooth, the canine, in the front of the lower jaw and by the nature of the horns, which are always short, covered for the greater part of their length, or entirely, by hairy skin, and are developed in the skin of the head as separate nodules of bone which, as growth proceeds, become firmly attached to the skull. Other characters common to the two representatives of the family are the possession of a long, extensile tongue and prehensile lips, both adaptations for plucking foliage, and the absence of all trace of lateral hoofs.

Giraffe. The Giraffe (*Giraffa camelopardalis*) is distinguished by its immense stature, due to the excessive length of the neck, which in the adult is about as long as the body, and of the limbs, and to the height of the fore quarters, the withers being much higher than the croup, so that the back is steeply sloped. The horns, which are present in both sexes, are quite short and tipped with hair, not with naked bone, the ears are comparatively small, the lips are long and mobile, and the tail is longish and provided with a terminal tuft reaching considerably below the hocks. The colour, as the specific name, meaning "spotted camel," indicates, consists of brownish spots on a pale ground. The bull, which is bigger in every way than the cow, may measure, with the neck erect, over eighteen feet from the crown to the sole of the foot. Such a beast will be about twelve feet at the withers and is able to pluck foliage twenty feet or so

MAMMALIA (SUBORDER RUMINANTIA)

from the ground, and a man of average stature can easily stand between his fore legs. The cow is from two and a half feet to three feet shorter. The period of gestation is between fourteen and fifteen months and only one calf is born at a time. It is the same colour as the parent, but has the neck relatively much shorter and the horns indicated by a pair of tufts of hair.

Giraffes are found in suitable localities all over Africa south of the Sahara, excluding the thickly-forested districts of the Congo; and they are represented by several local races, differing from each other in pattern and colour, and by the development in the bulls of a median bony elevation on the forehead in front of the two horns. Such giraffes have been called "three-horned." Occasionally, also, there is an additional pair of smaller bosses on the back of the head behind the horns, making so-called "five-horned" giraffes. The handsomest of all the races is the Somaliland Netted Giraffe (*G. c. reticulata*), which has large dark brown spots separated by a network of whitish lines. The typical Soudanese and Nubian form (*G. c. camelopardalis*), which extends across North Africa, has paler, more widely-separated spots. In the Tanganyika Giraffe (*G. c. tippelskirchi*) the spots are stellate, with indented edges. In these northern kinds, the additional horn-like bosses on the head are of common occurrence in adult bulls, and the legs are almost without spots; but in the dark-spotted Cape Giraffe (*G. c. capensis*), which formerly extended as far south as the Orange River, only the two normal horns are present and the legs are spotted to the hoof.

The habits of giraffes are similar wherever they are found. They frequent open bush country, often dry localities, where acacias, upon the foliage of which they principally feed, are to be found. Deep forest, thick jungle and marshy ground, are quite unsuited to them. They live in herds, often associating with zebras, ostriches and antelopes, and are exceedingly difficult to stalk by reason of the wide range of vision their great stature gives them. Many sportsmen, too, have testified to the protective value of their colour and pattern, which blends with the chequered background of branches and foliage. Feeding on green leaves, they are able to go a long time without water, but apparently drink freely when opportunity offers; and lions, their only enemy besides man, lie in wait for them at the pools. When drinking, they are compelled to straddle their fore legs wide apart to enable the mouth to reach the ground. As might be guessed from their build, they have a most ungainly gallop, but can cover the ground at considerable speed; and when traversing wooded country, they carry the head low, dipping it under branches which threaten to check their progress. Their means of defence are limited to striking with the head, which in the bull is extraordinarily heavy, and kicking with their powerful feet. As many people must have noticed in the Zoological Gardens, they have a peculiar odour, particularly the bulls. Another peculiarity about

OKAPI (OKAPIA JOHNSTONI)

them is their silence. It has been stated, indeed, that they are dumb, although their vocal organs are known to be normally constructed ; but one of the game wardens in East Africa records hearing a cow call, the sound being compared to the bleat of a sheep.

Okapi. Although the body of the Okapi (*Okapia johnstoni*) is short and plump and its limbs and neck tolerably long, it has none of the exaggerated height and elongation of the neck seen in the giraffe. It is also much smaller, the female, which, unlike the female giraffe, is hornless and bigger than the male, standing only between five and five and a half feet at the withers. Its ears, too, are much larger, and its lips shorter ; the horns, which may be five inches long, do not appear before maturity, and ultimately acquire a naked, bony point ; and the colour is quite peculiar, the body and neck a rich, dark brown, the head largely buffish-white, and the hind-quarters striped black and white from the root of the tail to the hock and the fore limbs from below the shoulder



[F. W. Bond.

THE OKAPI (*Okapia johnstoni*).

The Okapi inhabits the Semliki and Ituri forests of the Upper Congo and feeds solely upon leaves.

MAMMALIA (SUBORDER RUMINANTIA)

to the knee, the lower portion of the limbs being white, with a thick black fetlock ring.

The Okapi inhabits the Semliki and Ituri forests of the Upper Congo and feeds solely upon leaves, there being no grass under the thick canopy of branches and foliage overhead. It avoids swampy ground and is very difficult to stalk on account of the keenness of its scent and hearing, its large ears compensating for the restricted range of vision imposed by the darkness and vegetation of its habitat. When alarmed it slips quietly away or makes off at a gallop, carrying its head, like a giraffe, stretched forwards in a line with the back. It is solitary or found in pairs and only one calf, a clumsily-built little creature, resembling its parents in colour, is born at a time. The Okapi is said to be even stronger than a buffalo and a very vicious kicker.



[W. S. Berridge.
RED DEER (*Cervus elaphus*).
This deer is typically reddish-brown in summer, greyer in winter,
and paler below, with a buff patch on the rump.

Family Cervidae (*Deer*)

The Deer are distinguished from the other families of the Pecora by the presence in the males of either characteristic horns, called antlers, or of long, tusk-like upper canines; occasionally antlers and tusks co-exist, and only very rarely are antlers absent.

Antlers differ from the horns hitherto described in growing from the summit of a bony, skin-covered stalk or pedicle and in consisting, when functional, of dead, naked bone which is periodically shed and replaced. In cold and temperate latitudes where the seasons of the year are well marked and the breeding time fixed, the shedding and replacement are annual. But in the tropics there is no fixed period. As soon as the antler is shed, the bud of the new one, covered with soft, hairy vascular skin, the "velvet," appears on the summit of the pedicle. The bud grows rapidly and, becoming ossified, gradually assumes the form characteristic of the species, covered the while by the "velvet" and nourished by the blood contained in the vessels. At the base of the antler there is a bony swelling, the "burr," and at this point, when the antler is full sized the blood-supply is cut off. The velvet consequently dies and finally peels away in long strips, leaving the antler cleaned or "burnished." The well-known grooves which roughen the antlers are the channels along which the blood vessels passed. Antlers are exceedingly variable in size,

DEER (FAMILY CERVIDAE)

shape and the number of branches, or "tines," they bear. They are found usually only in stags and are primarily used in rival combats for the hinds or does. But such contests seldom end fatally for either combatant. It is not to the advantage of the species that they should do so, and the function of the tines is probably to act as guards to prevent the infliction of fatal wounds.

Deer are mainly woodland or forest animals and are found in suitable localities all over Europe, Asia and America, but are absent from Africa, apart from Barbary, where the Red Deer occurs.

By the skeleton of the feet the deer are divided into two groups. In

the first the long bones (*metacarpals*), which in "lower" families of Artiodactyls, like pigs (page 637), run from the wrist, or "knee," to the lateral digits of the fore foot, are, when present, represented by their upper ends only. This group, called *Plesiometacarpalia*, is almost restricted to Europe and Asia, only one species, the Wapiti, wandering into North America. A complete gradation can be traced in this group from highly-



DUKE OF BEDFORD'S DEER.



Photos]

PERSIAN RED DEER OR MARAL.

[James's Press.

MAMMALIA (SUBORDER RUMINANTIA)

organized species as large as a horse, with huge, many-branched antlers and no upper canine teeth, to more primitive species, no bigger than spaniels, with tiny, spike-like antlers and long, tusk-like upper canines.

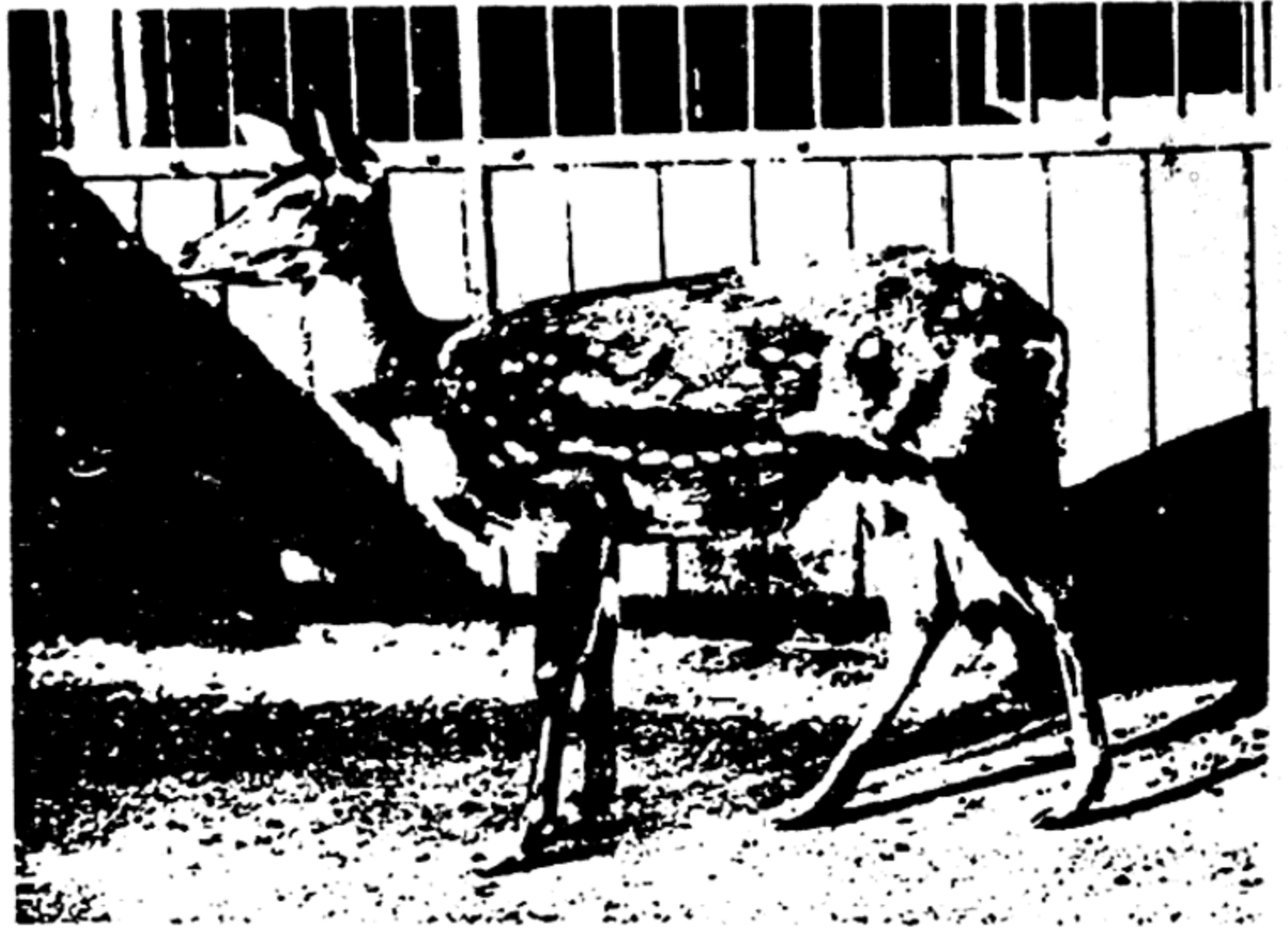
In the second group, the *Telemetacarpalia*, the bones in question are represented by their lower ends only, which support the lateral digits of the fore foot.

Plesiometacarpalia.

To the Plesiometacarpal section belong the typical Stags (*Cervus*), of which the common Red Deer and the Wapiti are the best-known representatives.

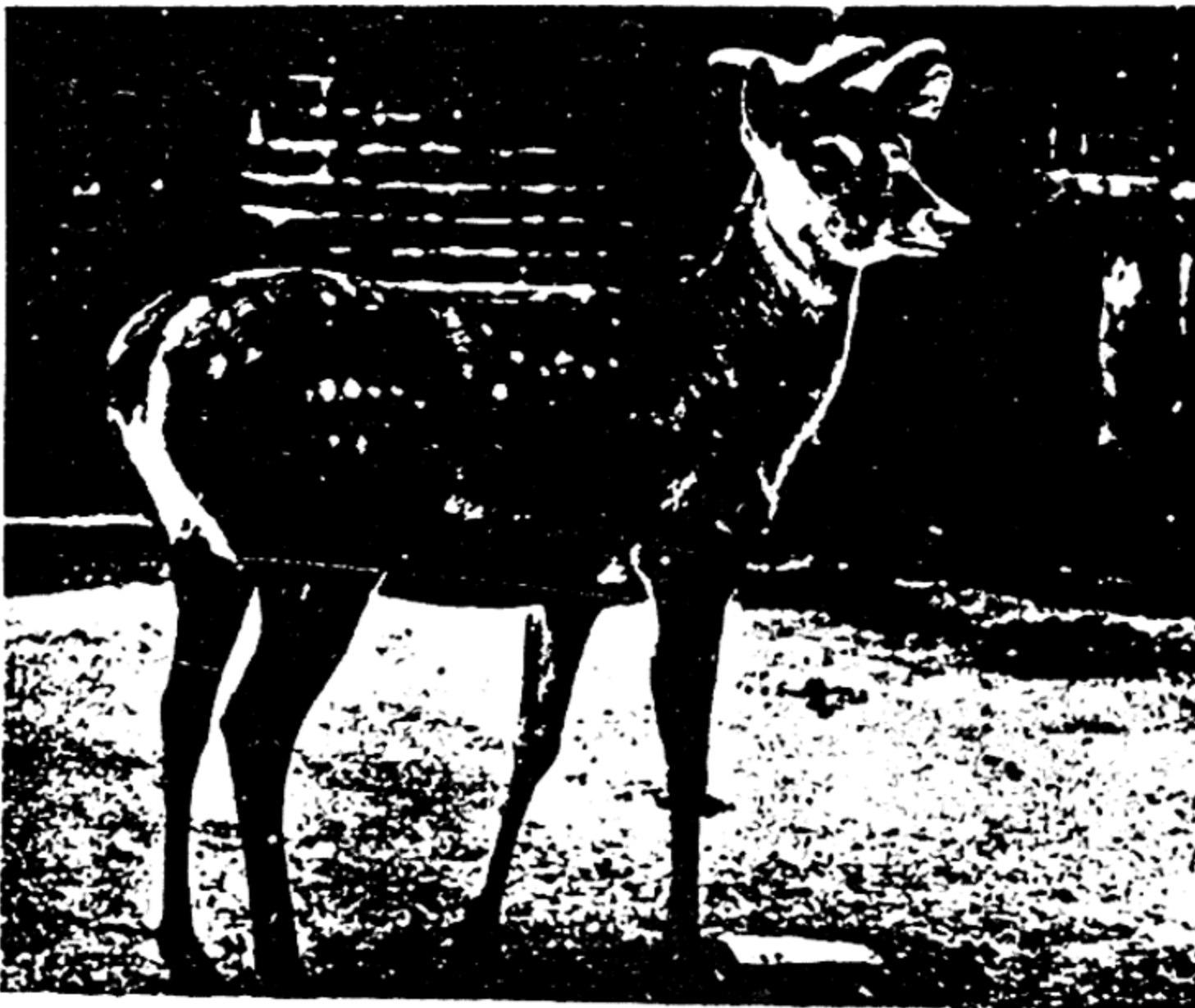
Red Deer (C. elaphus). This is still found in Great Britain and Ireland and is more abundant on the Continent. It is typically reddish-brown in summer, greyer in winter and paler below, with a buff patch, involving the tail, on the rump. The height of the stag is about four feet and the weight about three hundred pounds and upwards. The antlers, which

grow in the summer and are in use in the winter, carry usually six tines on the "beam," and since the names given to these tines are applied to those of other deer, they must be mentioned. The lowest is the "brow," the second the "bez," the third the "trez," the remaining three forming a cup at the summit being the "sur-royals." A stag with six tines on each antler is called a "twelve-pointer" or a "royal hart."



FORMOSA DEER.

This deer is found in the mountains of the island of Formosa. The coat is rather paler than that of the Japanese Deer (*Sika*), of which it is a local race.



[Photos]

THAMIN OR ELD'S DEER.

[James's Press.]

RED DEER (CERVUS ELAPHUS)



By courtesy of]

[Canadian National Railway.

A HERD OF WAPITI AT WAINWRIGHT, ALBERTA.

This is a much bigger stag than the Red Deer, is paler and more fawn in colour, with a much larger patch on the rump.

In the breeding season, in the autumn, the full-grown stags engage in fierce contests for the possession of as many hinds as they can collect, and at this time they are very noisy, their incessant roaring resounding through the forest. The period of gestation is about eight months : and the fawn, which, like that of most deer, is spotted with white, is dropped in heather or bracken, where it remains concealed and is visited periodically to be suckled by its mother, who never strays far from the spot. The duration of life is usually about twelve years, but occasionally considerably more.

There are several races of the Red Deer, the best defined being the Maral (*C. e. maral*) of Northern Persia, which is considerably larger than European specimens.



[W. S. Berridge.

JAPANESE OR SIKA DEER (*Sika nippon*).

These are brown in winter, reddish and spotted in summer, and stand some three feet in height.

MAMMALIA (SUBORDER RUMINANTIA)

Wapiti (*C. canadensis*). This is a much bigger stag than the Red Deer, is paler and more fawn in colour, with a much larger patch on the rump and a shorter tail. The height is as much as five feet, or more. The antlers, also, are different, the fourth tine being very long and the end of the antler bent abruptly backwards. In North America, where this stag is known as the "elk," there are several local races and others are found in Central Asia.

Other stags related to the Red Deer and the Wapiti found in Asia are the Hangul (*C. hanglu*) of Kashmir and the Shou or Wallich's Stag (*C. wallichi*) of Nepal and Sikkim. In these the hair on the rump is white and the tip of the antler is typically forked.



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen.

AXIS OR SPOTTED DEER (*Axis axis*).

This deer is reddish in colour and has white spots at all ages and seasons.

Japanese Deer. In Central Asia there is another group of Deer distinguished from *Cervus* by their smaller size, longer tails, simpler antlers, with the "bez" tine absent, and by the coat being spotted, at least in summer. From its introduction into various parks in the British Isles, where it has been crossed with the Red Deer, the Japanese Deer (*Sika nippon*) is a familiar example. It is brown in winter, reddish and spotted in summer, and stands about three feet in height.

Swamp Deer. In tropical Asia there are several larger and smaller species not so closely akin to *Cervus*. The Swamp Deer or Barasingha (*Rucervus duvaucelii*) is distinguished by its large ears, bright red colour, and by the shape of its antlers. It inhabits the open forest and grassy plains, not swamps as its name suggests, of Northern India, congregating in vast herds during the breeding season.

SAMBAR—CHITAL—HOG DEER

Thamin or Eld's Deer (Panolia eldi). This is, on the contrary, generally found in swampy plains in Burma, Siam and the Malay Peninsula. It is brown in colour and has peculiar antlers, the brow tine and beam forming a continuous curve.

Indian Sambar (Rusa unicolor). This deer, sometimes called Elk by Indian sportsmen, is rather larger than the Red Deer, is brown throughout life, and has massive three-



WAPITI (*Cervus canadensis*).
In North America this stag is known as the "Elk."

tinued antlers, which may be carried for several years. It is usually found in wooded, hilly districts in India and Ceylon; but related races extend through the Malaysian Islands to Borneo.

Chital or Axis Deer. A very handsome stag smaller than the Sambar, the height being only about three feet, and further differing in its reddish colour and white spots at all ages and seasons, is the Chital or Axis Deer (*Axis axis*), which mostly inhabits the jungles in the alluvial plains of India and Ceylon.



Photos]

[W. S. Berridge.

AXIS OR SPOTTED DEER (*Axis axis*).
Also known as the Chital, this deer mostly inhabits the jungles in the alluvial plains of India and Ceylon.

Hog Deer. A second species, the Hog Deer (*Axis porcinus*), is much smaller than the Chital, only about two feet high, and browner in tint and only indistinctly spotted when full grown. It ranges from Ceylon to Siam, and is typically solitary or found in pairs.

Several small species of deer related to the Hog Deer and Sambar are found in the Philippines and other islands of the East.

MAMMALIA (SUBORDER RUMINANTIA)

Fallow Deer (Dama dama). This deer, which is commoner in English parks than either the Red or Japanese Deer, is like the latter, an imported alien, its original home being the Mediterranean countries. It has very characteristic antlers with the summit spread, flattened (palmated), and armed with several small tines. Its height is about three feet, and the colour of the typical variety is fawn, decorated with white spots in summer, and greyish in winter. But a dark blackish-brown variety is almost equally common.



[D. Seth-Smith.]

KASHMIR DEER.

This fine stag may stand over four feet at the shoulder, and the horns may reach this same length.

Milu or David's Deer (Elaphurus davidianus).

This is as large as the Red Deer and is the only species with a longish, tufted tail. The antlers, too, are peculiar, being of large size, and two-forked, the stout, long brow tine growing nearly vertically upwards and the thinner beam backwards, close to the back. The only known examples of this stag are preserved by the Duke of Bedford at Woburn. These are the descendants of specimens originally kept in the Royal Park in Pekin.

Muntjacs or Barking Deer (Muntiacus).

These are represented by many species ranging from India to China and Borneo. They are small deer distinguished by the association in the males of long, tusk-like upper

canines with antlers which are short, two-pronged and supported on very long pedicles. The Muntjacs are small deer with short legs, large ears and a longish tail, and mostly inhabit thick jungle or bush, creeping stealthily about in the undergrowth, and living singly or in pairs. The young, one or two in number, are spotted. The best known is the Common Muntjac

MUNTJACS—TUFTED DEER

(*M. muntjak*), known to sportsmen from its call as the "Barking Deer." Its colour is mahogany-red and its height a little over one and a half feet.

Tufted Deer (*Elaphodus cephalophus*). This deer and its allies inhabits central and southern China, and is so named on account of a tuft of hair on the crown. They are distinguished from the Muntjacs by the antlers consisting of a single minute spike.

Telemetacarpalia. The second division of the Deer family, defined above (page 694), is mainly American, only the Roebuck, the Chinese Water Deer and the Musk Deer being confined to the Old World and the Elk and the Reindeer occurring in both the Eastern and Western Hemispheres:



SWAMP DEER OR BARASINGHA (*Rucervus duvaucelii*).
This deer inhabits the open forest and grassy plains, not swamps as its name suggests, of Northern India.



SAMBAR DEER (*Rusa unicolor*).
This is rather larger than the Red Deer.

As in the first division (page 693), a gradation can be traced from large, highly - organized species with well-developed, many-tined antlers and no canines, to small more primitive species with spike-like antlers or without antlers but large, tusk-like canines.

Elk or Moose (*Alces alces*). This is the largest and least elegant of all Deer, the legs being very long, the body, tail and neck short

MAMMALIA (SUBORDER RUMINANTIA)

and the muzzle greatly swollen. The antlers are sometimes simple and erect, but typically are many-tined, palmated, and project laterally from the sides of the head. The colour is brown, with the legs pale. The height may be nearly seven feet and the weight over one thousand pounds. It inhabits the northern forested districts of North America, Asia and Europe; but



MUNTJAC OR BARKING DEER (*Muntiacus muntjak*).
This deer is mahogany-red in colour and a little over one and a half feet in height.

is now very rare in Europe. In America, where the finest specimens are found, it is called the Moose. Its diet consists of foliage, twigs, mosses, lichens and aquatic plants, in search of which it wades into marshes and lakes; but on account of its long legs, short neck and swollen muzzle, it is unable to graze on short pasture. It is fond of the water and during hot weather frequently stays for long periods immersed in rivers and lakes. The pairing season, when the bulls are very pugnacious, is in the autumn,



[Photos]

FALLOW DEER (*Dama dama*).

[W. S. Herridge.

The colour of the typical variety is fawn, decorated with white spots in summer and greyish in winter.

and the calves, from one to three, are born about eight months later. The Elk is not truly gregarious, small family parties, which occupy clearings in the forest called "moose-yards," being the most that are found together.

Reindeer or Caribou (*Rangifer tarandus*). This is the only member of the Deer family in which antlers are present in both sexes. They are

REINDEER OR CARIBOU

similar in plan to those of the Old World deer, but the brow tines, one of which is usually larger than the other, and the trez tines carry supplementary prongs. Otherwise the modifications of the Reindeer are mostly adaptations to its habitat. The lateral hoofs reach the ground and the main hoofs are very broad so as to facilitate movement over snow and swampy ground; the coat as a protection against cold is very thick and the nose is overgrown with hair.

The ears and tail are short, the colour is brownish with lighter areas, the height is about four feet or a little over and the average weight of males is from three hundred to three hundred and fifty pounds, the females being one hundred pounds less.

The distribution of the Reindeer coincides in latitude with that of the Moose, but extends northwards to the borders of the Arctic Ocean. The species is not, however, restricted to snowy wastes. In North America and Siberia the northern herds migrate southwards in winter to districts where vegetation is available; but in Spitzbergen and other Arctic islands where their

movements are more restricted, they are at times hard pressed for food at that season and may be reduced to eating cast-up seaweed, and to get at grasses and lichens they scrape away the covering of snow with their feet, antlers and noses.

There are several different kinds, two in North America, where they are known as Caribou, being particularly well defined. The Barren-ground Caribou, inhabiting the tundras, is a smaller race, with thinner antlers than the Woodland Caribou, which is found even to the south of the St. Lawrence.

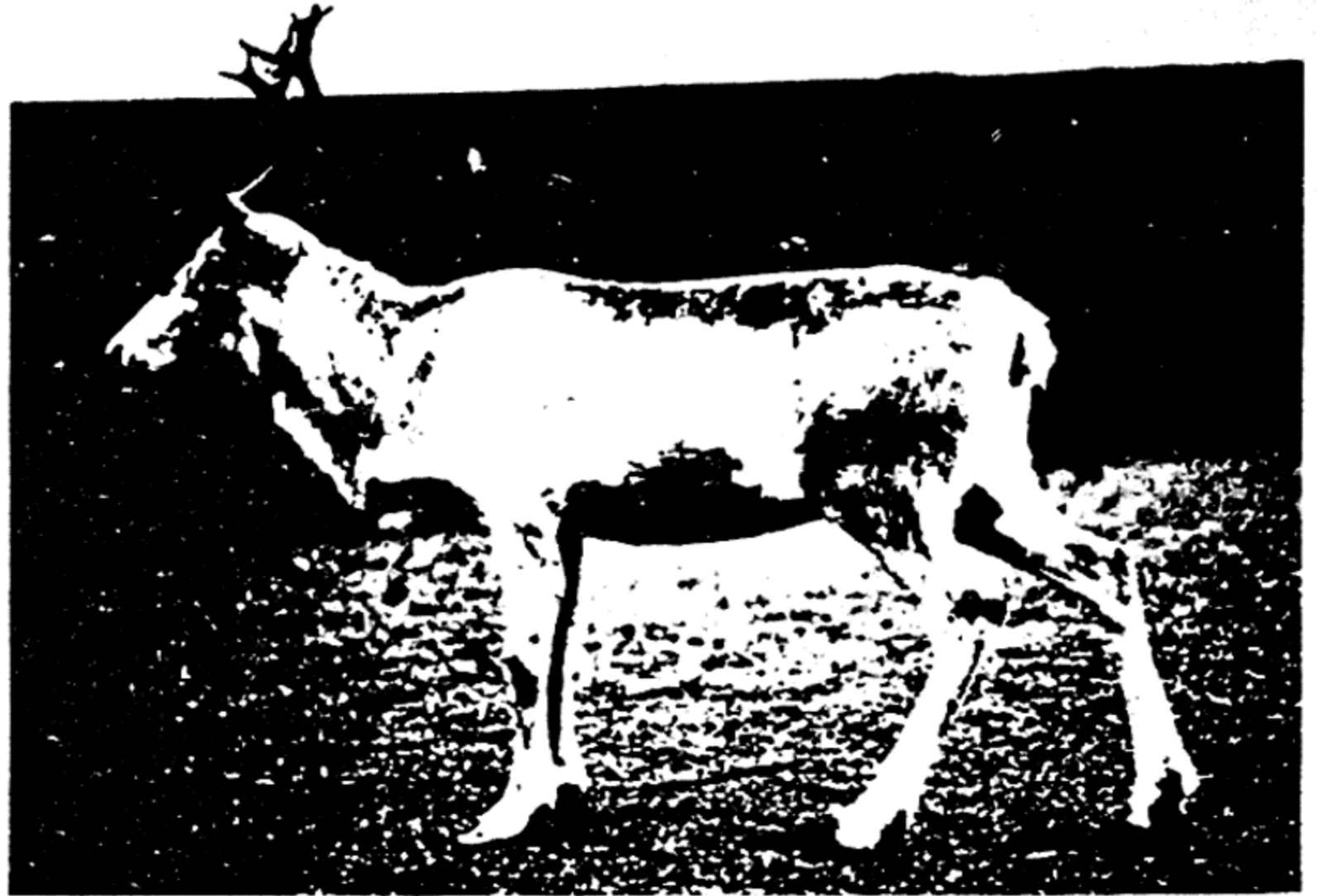


By courtesy of
AMERICAN ELK OR MOOSE (*Alces alces*).
This is the largest of all deer; the height may be nearly seven feet and the weight over a thousand pounds.

[Canadian Pacific Railway.]

MAMMALIA (SUBORDER RUMINANTIA)

In Lapland the Reindeer has long been domesticated and is to the natives what the camel is to the nomads of Asia and the Sahara, supplying them with milk, flesh, hides and means of transport. Herds of this small European race have, within recent years, been imported into North America, where they serve the same purposes as in their native home.



REINDEER OR CARIBOU (*Rangifer tarandus*).
This is the only member of the deer family in which antlers are present in both sexes.

Roebuck (*Capreolus capreolus*). This, although small, is an interesting representative of this group as still being a member of the British fauna. It is found in Scotland, whence specimens were brought to Dorsetshire and turned loose. The colour in summer is reddish, in winter greyish-brown, with a large white patch on the rump. The legs are long but the tail is vestigial. The height is about two feet, the weight fifty pounds or more. The antlers, usually about eight inches long, have typically three prongs



Photos] MILU OR DAVID'S DEER (*Elaphurus davidianus*). [W. S. Berridge.
This is the only species with a long, tufted tail.

rising from a long erect basal stalk. They are shed generally in December and the new ones are functional by March, dates very different from those of the antler-change in the Red Deer. The fawns, sometimes two in number and born in May, are spotted with white. Roebuck live in small herds and feed on grass and foliage in the early morning

DEER (FAMILY CERVIDAE)



ROEBUCK (*Capreolus capreolus*).
The colour in summer is reddish, in winter greyish-brown, with a large white patch on the rump. Height about two feet.

and Bolivia, and as it is traced southwards its size decreases, its colour changes and its antlers become simplified. The related Mule Deer (*O. hemionus*) has larger ears, a black-tipped tail and is more restricted in range, occurring from British Columbia to Mexico. Here too, the size is smaller and the antlers are simpler in southern races. The Black-tailed Deer (*O. columbianus*), ranging from Alaska to New Mexico, has the whole of the upper side of the tail black and the ears smaller than in the Mule Deer.

Marsh Deer, Pampas Deer and Pudu. In South America there are several species, the largest being the Marsh Deer (*Blastocerus dichotomus*), which is red in colour, nearly as large as the Red Deer and inhabits the forests of Brazil and the Argentine. Smaller and yellowish-brown in colour is the Pampas Deer

and evening. This Roebuck is found all over central and south Europe in suitable localities and allied races occur as far eastward as China.

White-tailed or Virginian Deer, Mule Deer and Black-tailed Deer. In addition to the Wapiti, Moose and Caribou, North America has three species of deer, about the size of Fallow Deer, each having many local races. The White-tailed or Virginian Deer (*Odocoileus virginianus*) is the most beautiful of all deer in the summer coat of red, ornamented with white spots, but in winter it is grey-brown and spotless. The species ranges from Canada to Peru



Photos]

[W. S. Berridge.

MUSK DEER (*Moschus moschiferus*).

These deer live at high altitudes in Central Asia, occurring in the Himalayas up to 12,000 feet.

MAMMALIA (SUBORDER RUMINANTIA)

(*B. bezoarticus*), found in the Pampas of the Argentine and Patagonia. These two species have branched antlers. But in the Andes of Peru and Chili there are species with simple, two-pronged antlers and in the forested districts of Central and South America there are others about the size of Muntjacs, with spike-like antlers. The tiniest of all the American Deer are the Pudus (*Pudu pudu*), which are about one foot in height, have spike-like antlers, and hardly a trace of the tail. They inhabit the cordilleras of Ecuador, Peru and Chili.

Chinese Water Deer (Hydropotes inermis). This is a primitive type of this division, having no antlers but large upper canine tusks. It resembles the Muntjacs in size and shape, and is found in China and Korea, frequenting riverside reed beds, where the does give birth to their fawns, from three to six in number.

Musk Deer. Still more primitive than the Water Deer, although resembling it in having long canine tusks and no antlers, is the Musk Deer (*Moschus moschiferus*), which takes its name from the presence in the male of a scent gland near the middle of the belly, which secretes the musk of commerce. The male also has a pair of scent-glands on the tail, which is nearly naked except for a terminal tuft of long hairs. The coat is harsh and pithy. The colour is brown, speckled with grey or buff and the height is about one and a half feet. The legs are long and powerful, the four hoofs being also long and widely separable. The period of gestation is five months, one fawn, as a rule, being produced at a time.

Musk Deer live at high altitudes in Central Asia, occurring in the Himalayas up to 12,000 feet. They are essentially adapted to districts where the cold of winter is severe, and their feet are well fitted for traversing snow-covered hill-sides. They are solitary in habit, feeding in the morning and evening on lichens, grass and foliage, and lying up during the day in brushwood.



A FIGHT BETWEEN TWO CARIBOU STAGS. [Major A. Rutcliffe Dugmore.]

Order PERISSODACTYLA (Rhinoceroses, Tapirs and Horses)

Although provided with "hoofs" like the Artiodactyla, the members of this order differ from them in being "odd-toed," the third digit being in the middle of the foot and symmetrically flanked by the second and fourth when these are present. There are other anatomical differences in the skeleton, and the intestine has a large saccular dilatation, the caecum. They appear to have been evolved from a different primitive type of mammal, their stock being the same as that from which the elephants and several other orders, described later, arose.

Family Rhinocerotidae (*Rhinoceroses*)

The Rhinoceroses are superficially so unlike Horses that no one would suppose them to be related. They are huge, ungainly, digitigrade beasts, the feet being broad and compact, composed of three equal toes, and provided with a horny sole; the limbs are short and stout; the hide is thick, at most scantily covered with hairs; the head is large, with a concave forehead, and the muzzle carries one or two horns, which grow through life and are composed of consolidated dermal fibres without a bony core. In the dentition the incisors are variable but are never more than six in number, above and below, and are not used for biting; the canines are absent and the six large cheek teeth are much less complicated in their ridges and loops of enamel than those of horses.

Rhinoceroses are now found in tropical Asia, from India to Borneo, and in East and South Africa. Their habits vary in details according to the species, but, being exclusively vegetarian in diet, and of great size, they must live where there is abundance of food, foliage, grasses and the like, and water. They are not gregarious, like the Equidae, at most two or three being usually found together. They have, therefore, no need of a loud call to keep a herd together, the voice being merely a grunt, snort or squeal, uttered under the stimulus of fear or anger. They have the reputation of being dull-witted creatures, with poor eye-sight but acute hearing and smell. When wounded or cornered, they will charge blindly at an assailant; but on the whole they are timid and inoffensive and prefer escape to fighting. Despite their size and bulk they can travel at considerable speed and there is something peculiarly horse-like in their swinging gallop. The single young one which is born at a time is able to follow its mother soon after birth.

The Asiatic species, three in number, differ in several important respects from the two African species, especially in possessing a pair of tusk-like incisor teeth in the upper and lower jaws. The lower projects forward on each side of the front of the mouth and is kept sharp by grinding against the upper. This tusk, not the horn, is the animal's weapon when charging and it is capable of inflicting a severe gash. For the lodgment of the upper tusk, the bone that carries it is comparatively large. Also the skin of the

MAMMALIA (ORDER PERISSODACTYLA)

Asiatic species is thicker and to facilitate movement is jointed or creased where the limbs and neck are attached to the body.

Indian One-horned Rhinoceros. The best and longest-known species of the Asiatic group, referred to the genus *Rhinoceros*, is the large Indian One-horned Rhinoceros (*R. unicornis*), which, as its name indicates, has a single horn on the nose. The hide is very thick, hairless, studded with rounded tubercles and jointed by great folds on the neck, in front of the shoulder and behind it and also in front of the hips and above the legs, but the fold in front of the shoulder does not pass over the back part of the neck. The height at the shoulder of a good specimen may be five feet or over but is usually about five feet six inches, and the weight is about four thousand pounds. The horn, which in wild specimens is present and equally long in the two sexes, is usually less than one and a half feet over the front curve, the record being two feet, with the basal circumference about the same; but in captive specimens it is frequently reduced to a mere stump by rubbing against the bars and walls of cages. Although at one time widely distributed in India, this Rhinoceros is now restricted to Nepal, Bhutan and Assam. It lives in the thick jungles of the alluvial plains, frequently in marshy places and is partial to wallowing in the mud.

Lesser One-horned Rhinoceros. Related to the last, but differing from it superficially in the mosaic pattern of fine scratches on the skin (which also lacks the tubercles), by the extension of the neck fold over the back, by its lighter build, and by its smaller head, is the Lesser One-horned Rhinoceros (*R. sondaicus*), sometimes but very inappropriately called the Javan Rhinoceros. In actual height, there seems to be little to choose between the two; but the male of this species has a comparatively small horn, seldom over ten inches along the curve, whereas the female is nearly or quite hornless. This species ranged from the Sanderbans of Bengal through Burma and the Malay Peninsula to Java. But its habitat is more varied than that of its larger ally, since, in addition to the swampy Sanderbans, it frequents forests, sometimes at considerable altitudes. It is now almost extinct.

Sumatran or Asiatic Two-horned Rhinoceros (*Ceratorhinus sumatrensis*). This differs from both the preceding species in having, as its name indicates, two horns, a larger in front and a smaller behind. Its skin, moreover, is covered, although not thickly, with coarse hair and is less jointed, having but one complete fold behind the shoulder. The size is comparatively small, the standing height being only up to about four and a half feet and the weight two thousand pounds. The front horn is occasionally over two feet six inches, but usually it is only about one foot over the curve, whereas the back horn is commonly from about three to six inches. The habits appear to be similar to those of the Javan Rhinoceros. This is a very widely-ranging species, extending from Bhutan to Assam through the Malay Peninsula to Sumatra and Borneo, but not occurring in Java. A few local



[Major A. Radclyffe Dugmore.

AFRICAN BLACK RHINOCEROS.

Rhinoceroses are now found in tropical Asia, from India to Borneo, and in East and South Africa. They are exclusively vegetarian in diet.

MAMMALIA (ORDER PERISSODACTYLA)

racés have been described, but the differences between them are too trivial to notice.

African Rhinoceroses. The two African species, both of which are two-horned, differ from the Asiatic in having no incisor teeth in either jaw. This defect has reacted on the jaws, the lower being shorter in front and the premaxillary bones of the upper small and functionless. Thus deprived of tusks for defence, these animals depend upon their horns, which are larger than in the Asiatic species, and to give support to the front horn, the principal weapon, the nasal bones which support it are much broader and rounder at the end. The skin, moreover, is sufficiently thin to dispense with the conspicuous jointed folds observable in the Asiatic species. On



SUMATRAN TWO-HORNED ASIATIC RHINOCEROS (*Ceratohinus sumatrensis*). [James's Press.]

In this rhinoceros the skin is covered, although not thickly, with coarse hair, and is less jointed than in the Indian species.

account of these differences, the African species are referred to a distinct genus, *Diceros*.

Although both are of nearly the same dark leaden hue, they are popularly called the Black and White Rhinoceroses.

Black Rhinoceros (*D. bicornis*). This is the commoner and better known of the two and may be at once distinguished by the pointed, prehensile

upper lip, narrower ears and the position of the eye, which is more under the back horn. The usual height is between five and six feet; but the recorded weight of a specimen which scaled rather less than three thousand pounds, indicates a more lightly-built animal than the big Indian Rhinoceros. The front horn varies in length from less than two feet, to over four feet and is sometimes thin and almost blade-like from wear. The back horn is occasionally almost as long as the front, but is usually considerably shorter.

The Black Rhinoceros lives in the open plains of Africa, from Abyssinia southwards. It was formerly plentiful in Cape Colony, but has been for the most part killed out in districts to the south of the Zambesi. It feeds, for the most part, on scrub, using its upper lip to pluck the foliage. It is the swiftest and generally the most active of all Rhinoceroses, and consequently the most dangerous when provoked to charge. It carries its head high when on the move; and the calf follows at the heels of its mother.

WHITE RHINOCEROS (*DICEROS SIMUS*)

White Rhinoceros (*D. simus*). This is distinguished from all other Rhinoceroses by its square-cut upper lip, lacking the prehensile lobe. It also has the head relatively larger than in the Black, the ears more spread and the eye farther back in relation to the hinder horn. It stands as much as six and a half feet in height and is the largest land mammal next to the Elephant and Giraffe.

The horns vary much in length, the front one being usually about three feet, but sometimes as much as five feet; the rear horn is usually about half the length of the other.

In times past, this Rhinoceros may have spread through East Africa from the Soudan to the Orange River. But it has only been found in the region of the Upper Nile and between the Zambesi and Orange Rivers. In South Africa it was almost exterminated by the end of the last century, the sole survivors being a few individuals in the Umfulosi Reserve, Zululand. The existence of the species near the source of the Nile and Wele River was a comparatively recent and unexpected discovery. Less alert and slower in movement than the Black, it is easily killed, even with spears, and the final extinction of the species, unless rigorously protected, will probably soon be accomplished.

Unlike the Black Rhinoceros, which is a browser, the white species is a



[Photopress.]

AFRICAN BLACK RHINOCEROS (*Diceros bicornis*).
There are two species of African Rhino, called popularly, the Black and the White, both of which carry two horns.



[Underwood.]

INDIAN ONE-HORNED RHINOCEROS (*R. unicornis*).
In captive specimens the horn is frequently reduced to a mere stump by rubbing against the bars and walls of cages.

grazer, as the shape of the upper lip indicates. It generally frequents fairly open country, but may be found in heavily-timbered bush. When on the move, the animal carries its head low, by reason of its great weight, with the muzzle close to the ground; and the calf is said to precede the mother, guided by her forwardly-directed long horn. In colour, the "white" Rhinoceros is a light, dirty brown.

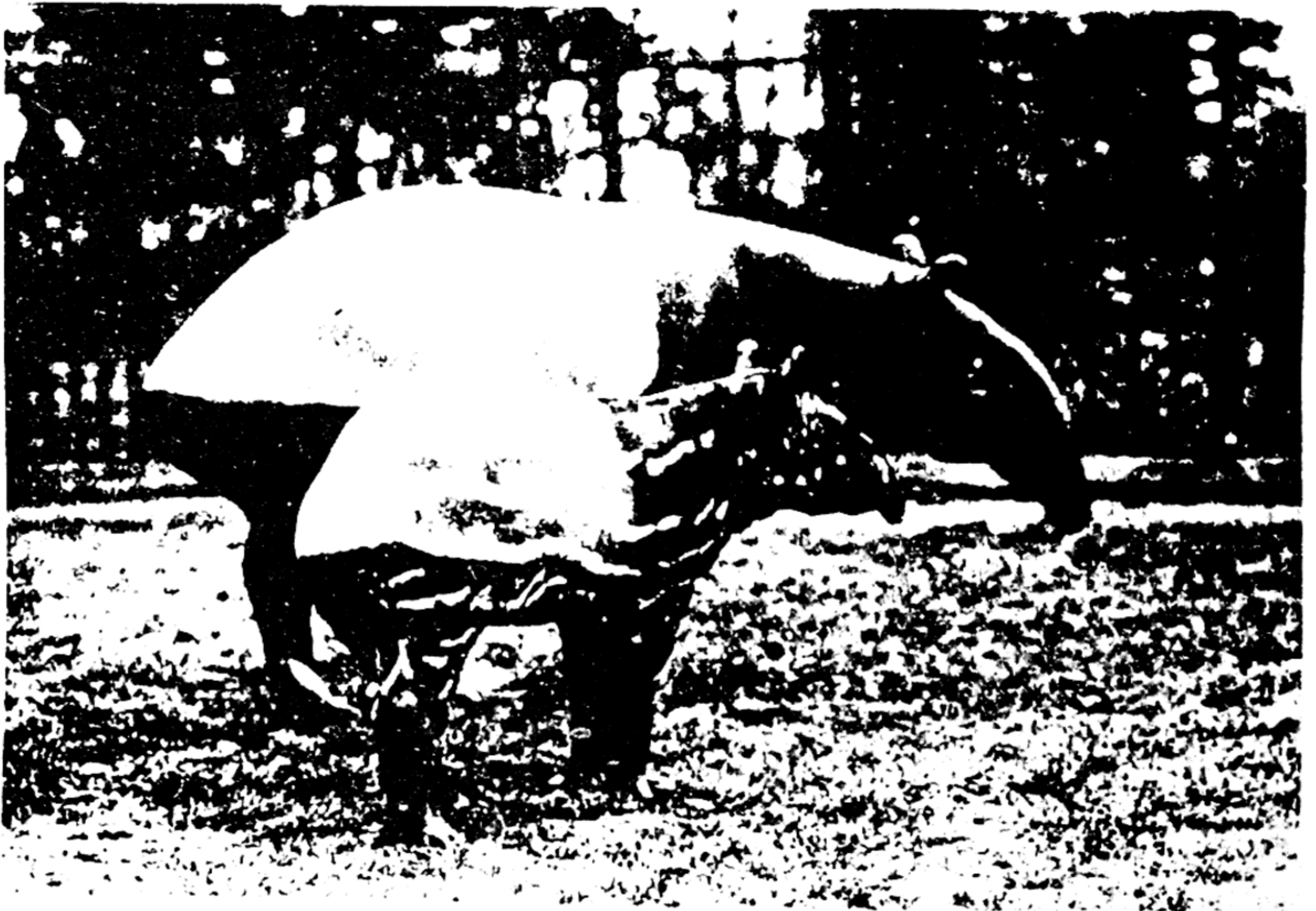
MAMMALIA (ORDER PERISSODACTYLA)

Family Tapiridae (*Tapirs*)

The Tapirs are short-legged and digitigrade like the rhinoceroses, but have four toes on the fore feet. The toes, which have long, narrow hoofs, are capable of being spread. Also, the body is covered with short hair, the tail is very short, and the snout and upper lip are developed into a short but thick, flexible trunk used for hooking foliage into the mouth. In association with the trunk, the nasal openings in the skull are situated far back, instead of being terminal as in rhinoceroses and horses.

In the dentition, the incisors and canines are complete as in the horses; but the lower canine is set forwards and with the outer upper incisor forms a pair of short tusks on each side of the mouth. The crowns of the cheek-teeth are low and simple in structure, and carry four conical cusps.

Tapirs are timid, inoffensive creatures, browsing on forest foliage and dashing away through the undergrowth when alarmed, or, being expert swimmers, plunging into rivers to escape danger. They are mostly nocturnal and solitary, two or three at most being found together. The young, of which only one is born at a time, differs remarkably from the parents in colour, being deep brown with a pattern of longitudinal white stripes and spots which disappear in about six months' time.



[D. Seth-Smith.]

EAST INDIAN OR MALAY TAPIR AND HALF-GROWN YOUNG (*Tapirus indicus*).

This species is distinguished by its peculiar colour, the head, forequarters and legs being black and the loins white. The young differs remarkably from the parents in colour, being deep brown with a pattern of white stripes and spots.

TAPIRS (FAMILY TAPIRIDAE)



[Keystone.]

BRAZILIAN TAPIR (*Tapirus terrestris*)

The American species, four in number, are tolerably uniformly brown in colour, and considerably smaller than the Malay Tapir.

Tapirs are the only members of the Perissodactyla indigenous in America, which is now their headquarters; but there is an outlying member of the family found in the East Indies. This discontinuous distribution is explained by the extension of the family in former times over a wide area of the Northern Hemisphere and its survival in the two widely-separated countries above mentioned.

East Indian or Malay Tapir (*Tapirus indicus*). This is distinguished by its peculiar colour, the head, forequarters and legs being black and the loins white. It is also the largest of the species, standing close on four feet high. It inhabits the jungles of the Malay Peninsula, Sumatra and Borneo.

American Tapirs. The American species, four in number, are tolerably uniformly brown in colour and considerably smaller than the Malay Tapir, standing between three and three and a half feet high. Of these, the most widely distributed and best known is the Brazilian Tapir (*T. terrestris*), which is frequently imported to this country. It inhabits the lowland forests of the Amazon and its tributaries, and may be known by the crest on its forehead and neck. Its chief enemy, apart from man, is the jaguar. The Pinchaque or Roulin's Tapir (*T. roulini*), which has the neck rounded and not crested, is found in the mountain forests of Ecuador and Colombia up to about 8,000 feet. The other species, Baird's Tapir (*T. bairdii*), and Dow's Tapir (*T. dowii*), inhabiting Central America are distinguished from the rest by certain cranial characters, but nothing of note is known of their habits.

MAMMALIA (ORDER PERISSODACTYLA)

Family Equidae (*Horses, Asses and Zebras*)

The Horses, the highest types of this order, are distinguished by being "unguligrade" and single-toed; that is to say, they walk upon the terminal bone of the third digit only, this bone being encased in a large, compact hoof, the wrist, or "knee," and the ankle, or "hock," being raised high off the ground. The teeth consist of six strong incisors above and below, the canines, when present, are always small and the cheek teeth, neglecting the first premolar, which is of no functional importance and generally absent, consist of a similar series of six above and below in each jaw, each tooth being massive, prismatic, deeply imbedded and of persistent growth till old age is reached, the grinding surface, when worn, exhibiting an intricate pattern of loops and ridges of cement, enamel and dentine.



DAFFLE-GREY SHIRE OR CART HORSE.

[Gambier.

The limbs are clearly adapted for swift running over hard ground and the teeth for cropping and masticating the coarse grasses and other herbage of the open country these animals frequent. They are gregarious, and breed once in about every two years, a single foal being born at a time. The genuinely wild species assigned to the genus *Equus*, and popularly known as Horses, Asses and Zebras, are found only in Asia and Africa.

Horses and Ponies. The various breeds of domesticated Horses and Ponies (*Equus caballus*) are familiar to all; and in different parts of the world, in the Argentine Pampas, the North American Prairies and in the Steppes of Siberia, there are herds of "feral" horses, that is to say, wild horses descended from specimens which escaped from captivity. There is, however, one genuinely wild type known as Przevalsky's Horse (*E. caballus przewalskii*) and regarded as a race of the domesticated breeds. It is a sturdily-built pony, standing about twelve hands at the withers, with a massive head, small ears, heavy jaws and big teeth, its general colour being dun, with a mealy muzzle, a black stripe on the back and some black below the knees and hocks. In the short summer coat, the mane forms an erect crest and the tail is tufted; but in the long, thick winter coat, the mane tends to fall over to one side and some longish hairs grow on

HORSES AND ASSES



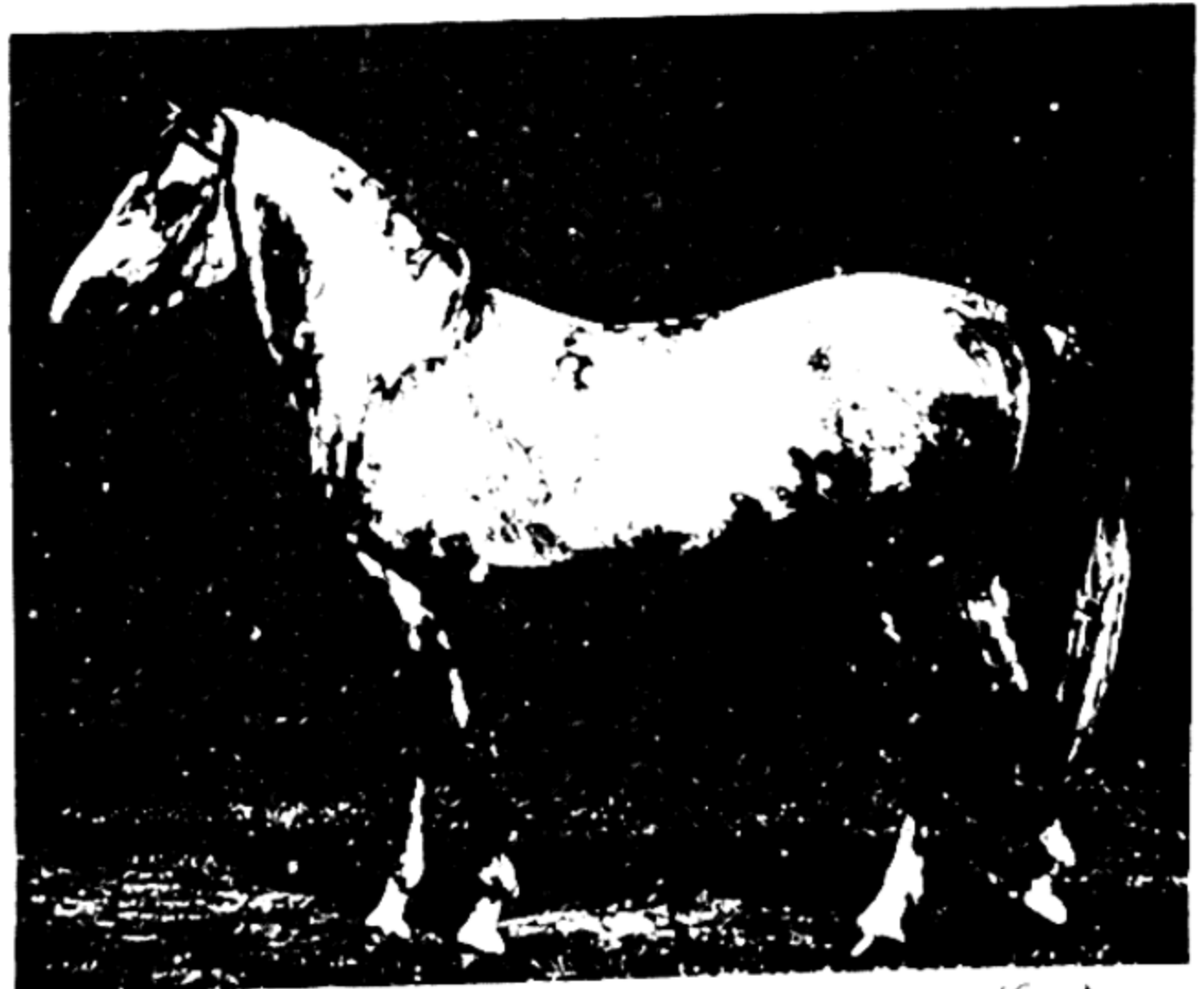
SUFFOLK PUNCH "WHIRLWIND."

the upper part of the tail. It inhabits Mongolia. Nothing of interest is known of its habits; but it associates and interbreeds with the feral ponies of the district and many of these hybrids have been imported to Europe and exhibited as genuine wild horses.

Asses. These differ from horses in one or two particulars. The hind legs never have a trace of the "chestnut" which is typically found below

the hock on the hind leg in all horses; the voice is a "bray" instead of a "neigh," and the period of gestation is about twelve months, one month more than in the horse.

Asiatic Wild Asses. Wild Asses belong to two distinct types, one found in Asia, the other in Africa. The Asiatic species are more horse-like than the African, their ears being smaller and their general hue sandy or dun above instead of slate grey. The voice, too, is distinct. It may be described as a stifled bray, since it consists of a squealing inhalation followed by a guttural exhalation; but it has none of the volume of the bray of the African species. The largest and handsomest is the Kiang (*Equus kiang*) of Tibet, where it is found at elevations up to about 16,000 feet. Apart from the crested mane and a stripe down the back, which, like the tail tuft, are black, the upper side is pale chestnut in summer, rather darker in winter when the coat is long and thick; but the muzzle, a large area of the neck below, the belly, legs and the backs of the thighs are creamy-white. Kiangs are powerfully built and stand from twelve to thirteen hands at the withers.



Photos]

ARABIAN STALLION.

[Cambier

MAMMALIA (ORDER PERISSODACTYLA)

They live in small herds, and when grazing are guarded by one of their number which watches the surrounding country at a distance of some two hundred yards from the rest and gives the alarm when danger threatens. They are swift of foot and strong swimmers, fearlessly crossing even rapid rivers.

In the deserts of north-western India, Persia, Syria, Tartary and as far to the north as Mongolia, there is a second species (*Equus hemionus*), which is smaller and more lightly built than the Kiang but resembles it in all essential habits. Having a wide geographical range, it is represented by several local races, the Mongolian race being known as the Dziggetai and the Persian and Indian race as the Ghorkar or Onager (*E. onager*).



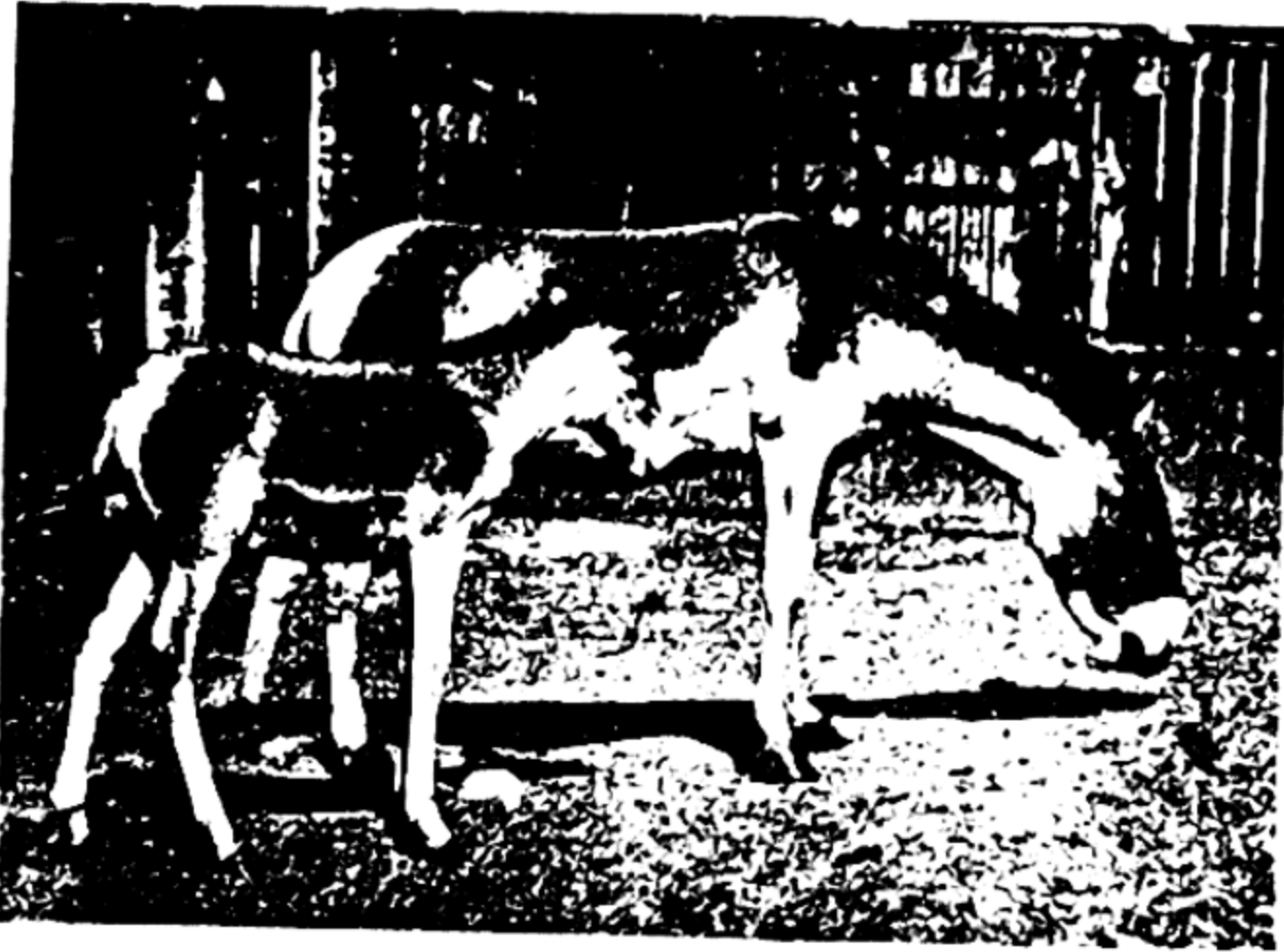
[W. S. Berridge.
AFRICAN WILD ASS (*Equus asinus*).
It is from the African Wild Asses that our domesticated
breeds are derived.

African Wild Asses. African wild asses (*Equus asinus*) are of particular interest because they are the stock from which our domesticated breeds were derived. They are restricted to Nubia, the eastern Sudan and Somaliland, but are now rare everywhere. They differ from the Asiatic asses in having much longer ears and narrower hoofs; their voice is the loud familiar bray and they are grey in colour above, white below, on the muzzle and round the eyes. They are handsome, strongly-built animals, considerably larger than the common domesticated donkey. They live in small herds in desert districts, and are remarkable for the great speed and sure-footedness with which they can traverse rough country. There are one or two local races, the best marked being the typical Nubian form, which

has a black patch at the base of the ear, a black stripe down the back and one across the shoulders and only faint stripes on the legs, marks which persist as tell-tale signs of descent in the domesticated type; and the Somaliland race, which has no black patch on the ear, at most a trace of the spinal and shoulder stripes, but strong bars on the legs.

Zebras. In East and South Africa, the asses are replaced and represented by the Zebras and Quaggas. Zebra, however, is merely a popular name for fully-striped members of the horse-tribe and does not indicate the kinships of the animals that bear it. The three very distinct species which pass under that name are merely linked together by the possession of stripes, a character inherited from the common ancestor from which the horses and asses, which have lost the stripes, are also descended.

ZEBRAS AND QUAGGAS



KIANG AND FOAL (*Equus kiang*).
This is the largest and handsomest of the Asiatic Wild Asses, being found in Tibet at elevations up to about 16,000 feet.

The largest, and some think the handsomest of the striped species, is Grévy's Zebra (*E. grevyi*), which stands about thirteen hands at the withers, the mare being as big as the stallion, if not bigger. It may be distinguished by its long, expanded and round-tipped ears, very small warts, and by its pattern, the stripes on the neck being broad, on the body, narrow; the spinal stripe is, however, very

broad on the croup, where it is separated from the adjoining stripes on the upper part of the quarters, which are vertical. The voice is a bray, unmistakably like that of the donkey. This species is found in the lowlands of Abyssinia, Somaliland and the northern parts of Kenya. It lives in open, scrub-covered plains, never in thick bush.

The Mountain Zebra (*Equus zebra*) is a very different looking animal from Grévy's Zebra. The ears, although large, are pointed and asinine in shape, and the head is more elegantly shaped and there is a small dewlap on the throat. The stripes are as complete as in Grévy's Zebra, those of the flanks passing on to the belly, but the spinal stripe is exceedingly narrow and in contact with the body stripes to the root of the tail. On the thighs they are remarkably broad, few in number and longitudinal, and the uppermost of them defines an area on the croup, covered with short, transverse stripes and called the "gridiron" from its fancied resemblance to that implement. The legs, which are delicately formed, have very narrow hoofs; but the "chestnut" is represented by a large, oval area of naked skin.



[Photos] [W. S. Berridge.]
MONGOLIAN WILD HORSE (*Equus caballus przewalskii*).
The general colour is dun, with a mealy muzzle, a black stripe on the back and some black below the knees and hocks.

MAMMALIA (ORDER PERISSODACTYLA)



By courtesy of]

[South African Railways & Harbours.

CHAPMAN'S QUAGGA.

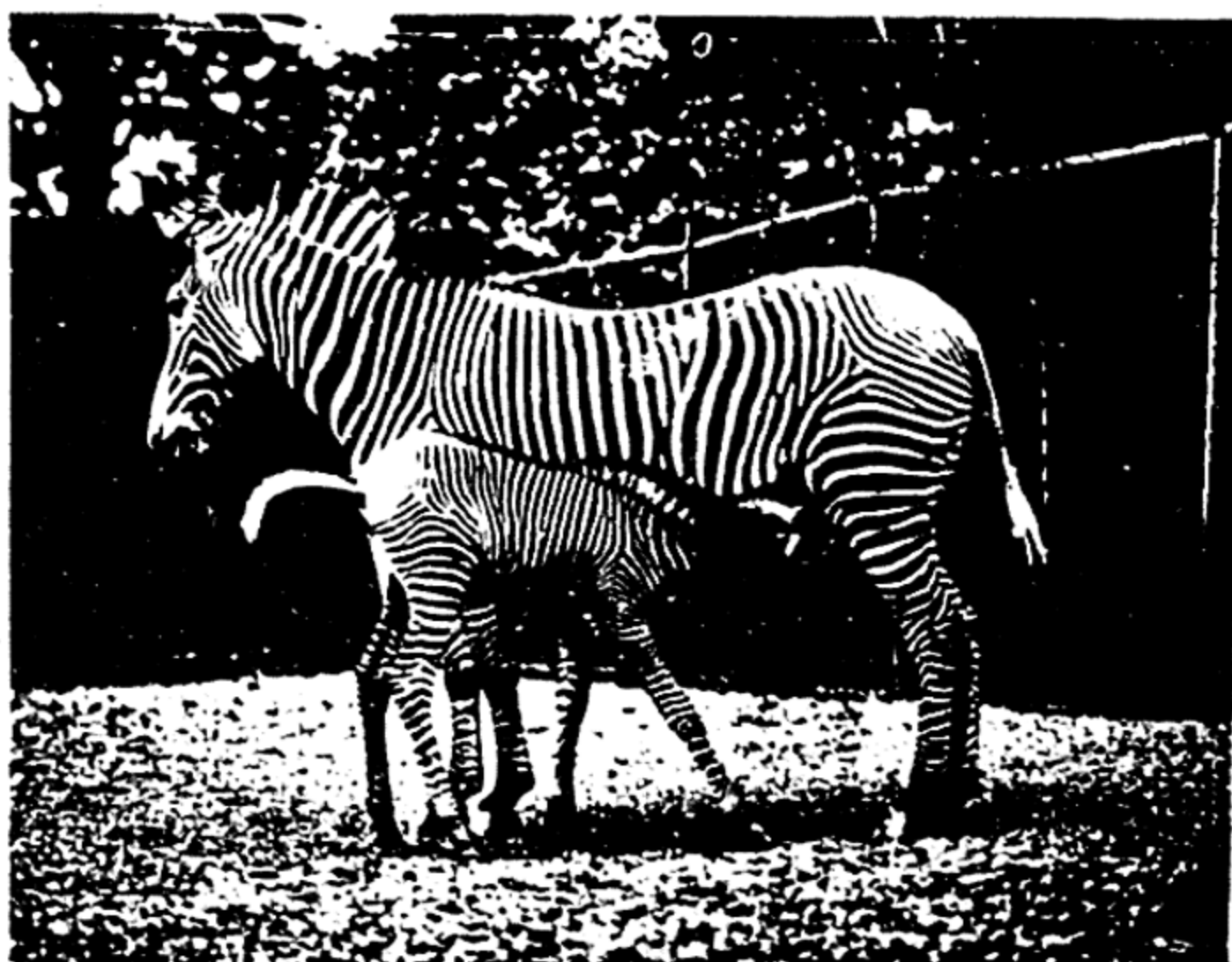
This Quagga is found in Bechuanaland.

attracted the attention of sportsmen by its beauty and the speed and precision with which it could traverse rocky, precipitous hill-sides. But indiscriminate slaughter, chiefly in the interest of the hide-trade, has brought it to the verge of extinction in that part of South Africa, a few herds only remaining, now happily under strict protection. It extends, however, through what was formerly German South-west Africa into Angola; but this western race, known as Hartmann's Mountain Zebra, differs from the Cape Colony race in being a little bigger and much lighter in colour owing to the widening of the white and the narrowing of the black stripes.

Quaggas. More nearly akin to the Mountain than to Grévy's Zebra is the third species (*Equus quagga*), known by a number of trivial and scientific names in accordance with its local variations. It differs from the Mountain Zebra in its smaller ears, broader hoofs, absence of the lappet of skin, or dewlap, on the throat, backwardly-growing hairs on the spine, and also in pattern. The stripes from about the middle of the flanks sweep boldly backwards at their upper ends and pass over the loins and croup, the stripes on the latter not forming a "gridiron" pattern. Average specimens stand about eleven and a half hands at the withers and their general appearance is more

This zebra, the smallest of all, stands about ten and a half hands at the withers. It is an unusually silent animal. There are no trustworthy records of the nature of its voice in the wild state and in captivity it seldom utters more than an angry squeal.

The typical race of this zebra was at one time plentiful in the mountainous parts of Cape Colony and early



By courtesy of]

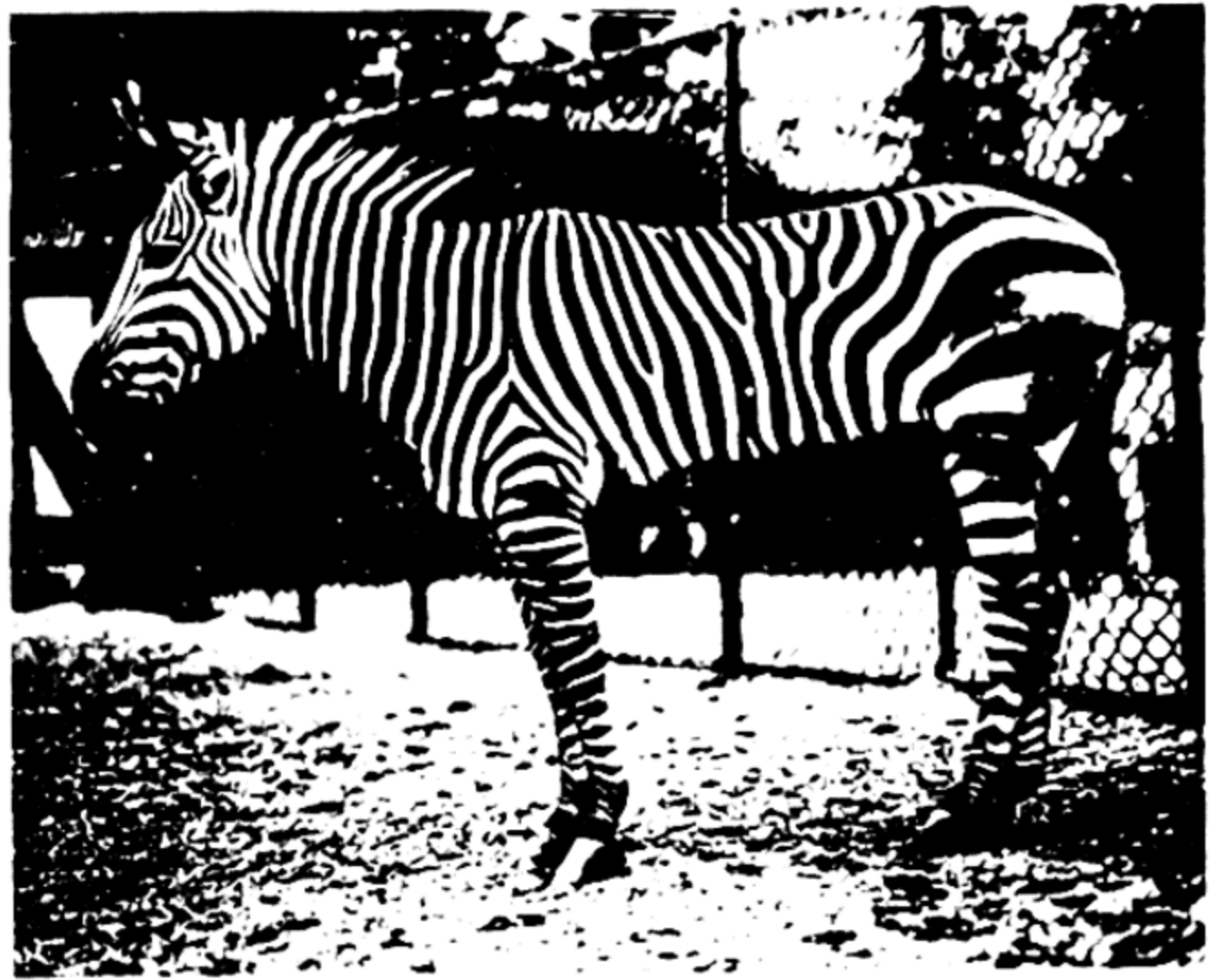
[Carl Hagenback's Tierpark, Stellingen.

GREVY'S ZEBRA (*Equus grevyi*).

In this species the stripes on the neck are broad, on the body narrow; the spinal stripe is, however, very broad on the croup.

QUAGGAS (*EQUUS QUAGGA*)

equine and less asinine than that of the Mountain Zebra. The voice is very distinct, at least from that of Grévy's Zebra. It has been well described as a repetition of the syllables "qua-ha-ha," which suggested the name "Khoua Khoua," used by the Hottentots and converted into "quagga" by the Boers, for the South African race, which was first made known to Europeans. This, the typical race, now extinct, had no stripes on the legs or hind-quarters below the tail, and



By courtesy of, *[Carl Hagenbeck's Tierpark, Stellingen]*
HARTMANN'S MOUNTAIN ZEBRA (*Equus zebra hartmannae*).
In the Mountain Zebras the stripes on the thighs are remarkably broad, and few in number.



[W. S. Berridge.]
CHAPMAN'S QUAGGA (*Equus quagga chapmani*).
The existing races of Quagga can be distinguished by having the stripes from about the middle of the flanks sweeping boldly backwards at their upper ends.

the stripes on the flanks were generally indistinct and more or less confluent, resulting in a mottled, brownish tint. But, judging from old pictures, there was a great deal of individual or local variation both in the general hue and the distinctness of the stripes. This Quagga, nevertheless, was a very different looking animal from those found in East and North Africa, which are completely and boldly striped all over with black and cream. Grant's Quagga of Kenya Colony and Crawshay's Quagga of Nyasaland are instances. But south of the Zambesi there are several races exhibiting a gradual evanescence of the stripes on the limbs and hind-quarters, and completely connecting the two extremes in pattern and colour described above. The best known of these intermediate races are Chapman's Quagga of Bechuanaland and Burchell's Quagga of Griqualand West. The latter, which most resembles the typical Quagga, is, like it, now extinct. There is no known explanation of this singular and striking change in the South African races of the species, which is essentially an inhabitant of the open plains and veldt of Africa.

Order PROBOSCIDEA (Elephants)

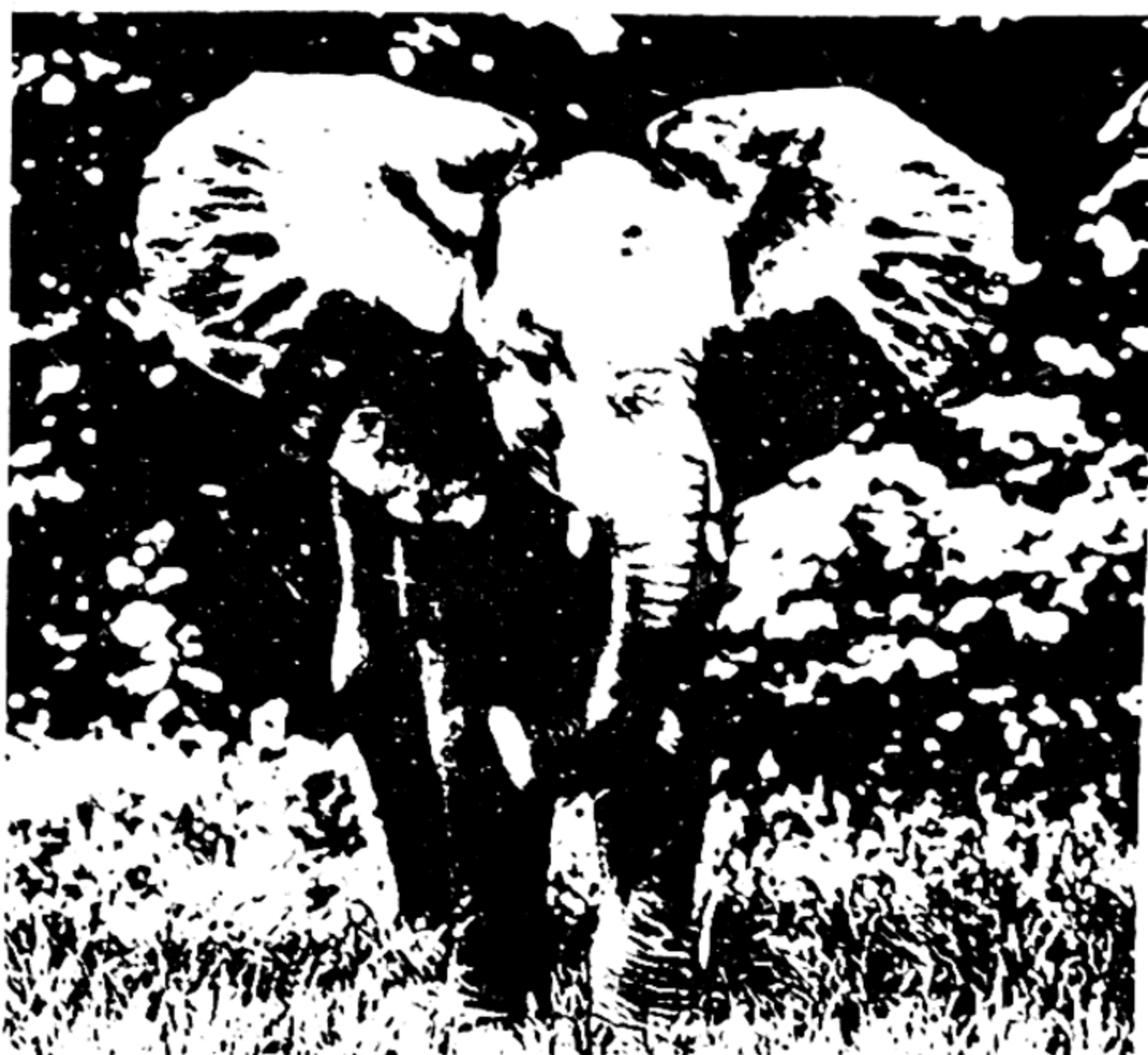
Elephants differ from all other mammals in appearance and in many anatomical characters. Their most noticeable peculiarity is the lengthening of the nose and upper lip into a long, muscular, flexible trunk, with the upper and lower rims of the terminal nostrils formed into two lobes, or lips, capable of picking up even small particles of food. The head is very massive and short as compared with its height, the eyes very small, the ears large and flap-like, and the neck so short that the movements of the head are greatly restricted. The legs are long, thick and columnar, and the feet short and broad. The animal, however, is digitigrade, resting on a large pad behind the hoofs of the five toes, the wrist and heel being raised off the ground. Another character of the limbs is the setting of the bones in a nearly upright line. This gives the peculiar swing to the hind limb when the animal is walking and enables it to kneel with the foot projecting backwards, a feat quite beyond the powers of most mammals, with the exception of man. The tail is long and fringed at the end with very stout, long bristles; but, except in the young, there are hardly any hairs on the skin, which is thick and wrinkled.

The shape of the head, with its large forehead, gives the elephant a sagacious look, suggesting a big brain. The brain, however, is quite small; but the bones of the skull are very thick, although full of air-cells, to lighten the weight; and the expansion of the head is to give attachment to the great muscles of the neck which have to support the weight of the trunk and teeth, especially of the two tusks, or "ivories," of the upper jaw, when these are of large size. The tusks are the only incisor teeth the elephant possesses. They grow throughout the animal's life and owe their commercial value to being composed of dentine or ivory, the enamel being absent. Canines are not developed; but the cheek-teeth are remarkable in a variety of ways. They are huge blocks, so huge that there is only room for one complete tooth, or parts of two, to be functional at a time above and below in the shortened jaws. There are six of them altogether. They are not, however, all developed at once, but successively, one behind another during about the first half of the animal's life. Each tooth, as it comes into use, has open roots and continues to grow for a considerable time to counteract the wear. But the wear is faster than the growth, and as the crown is ground down, the roots close and become absorbed, and the tooth, greatly reduced in size as it travels along the mouth, with its successor behind it, reaches the front of the jaw, where its remnant is ultimately shed. These teeth are also very elaborately made, consisting of a number of plates of dentine and enamel, united by cement, set one in front of the other. But the joining of the plates is secondary, each of them being developed from its own pulp quite separately from those before and behind it.

Indian and African Elephants.—There are two kinds of elephants,

INDIAN AND AFRICAN ELEPHANTS

the Asiatic or Indian (*Elephas maximus*) and the African (*Loxodonta africana*), which differ in many ways. The Indian has a high, bulging forehead, comparatively small ears covering the sides of the neck, and the tip of the trunk provided above with a finger-like lobe which closes down on the square-cut, lip-like lower rim. The African has a rounded, sloping forehead, enormous ears meeting on the top of the neck and covering a large part of the shoulder, and the upper and lower rims of the nostrils produced into two larger, more similar lips. The differences in the trunk are associated with differences in the way of picking up food. If a pile of soft bran or half a loaf is given to an Indian Elephant, the animal picks them up by coiling the end of its trunk round them. The African picks up as much of the bran as it can between the lips of its trunk, and, if it finds the bread too large to be grasped in that way, presses the end of the trunk against it and by exhausting the air from its nostrils, lifts it from the ground by suction. Small pieces of food, like biscuits or leaves, are picked up between the lips of the trunk by both species alike ; and so delicate are these implements that the common belief in an elephant's ability to pick up a pin is probably not far from the truth.



By courtesy of] [Carl Hagenbeck's Tierpark, Stellingen.
YOUNG AFRICAN ELEPHANT (*Loxodonta africana*).
The African Elephant has a rounded sloping forehead, enormous ears meeting on the top of the neck and covering a large part of the shoulder, and the upper and lower rims of the nostrils produced into two nearly similar lips.

A more important difference between the two species lies in the structure of the cheek-teeth, which are much more elaborate in the Indian Elephant. The plates composing them are narrow and flattened, so that a large number are packed together to build up the tooth. The number progressively increases from four in the first tooth in the young calf to over twenty in the last tooth, which comes into use at mid-life. In the African Elephant the plates are lozenge- or bow-shaped, expanding from the edge to the middle of the crown and are not nearly so numerous, the number for the first and last tooth, as indicated above, being respectively three and ten, the last having only about half as many as in the Indian Elephant. These

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differences are very clearly shown on the worn tooth by the alternating lines of cement, enamel and dentine ; and the name *Loxodonta*, meaning "bow-toothed," was given to the African Elephant on account of the pattern of the cheek-teeth.

Distribution of Elephants. The Asiatic Elephant ranges from the foothills of the Himalayas southwards through India and Ceylon and eastwards through Burma, Siam and the Malay Peninsula to Sumatra and Borneo. Slight differences exist between the typical elephant of India and those of Ceylon, the Malay Peninsula and Sumatra, but they are too trivial to call for further notice.

A century or so ago the elephant of Africa was found all over the continent, south of the Sahara, in the forests as well as in the plains, wherever the bush was thick enough to afford shelter and food. But in the southern districts to the south of the Limpopo River they have long since disappeared, apart from an isolated herd found in the Addo bush near Port Elizabeth. The ivory-hunters were the great factor in their extermination, and were it not for the imposition of legal restrictions upon the trade, a similar fate would have overtaken the elephants in every part of Africa occupied by Europeans. Some idea of the extent and rapidity of the slaughter may be gathered from Selous's estimate that in the three years preceding 1875 not less than one hundred thousand pounds weight of ivory was traded from Matabeleland alone, and a few years ago it was computed that the tusks imported annually into Antwerp alone represented over eighteen thousand elephants.

Several different kinds of African Elephants, representing local races, have been named on the evidence of alleged differences in the shape of the ears of mounted Museum Specimens. There appear, however, to be only two well-defined types, the big ordinary kind, with long, pointed ears, found in the more open plains from Abyssinia southwards through East Africa, and a smaller kind with shorter, rounder ears, found in the Congo forest. From the shape of its ears this African Elephant was called *Loxodonta africana cyclotis*.

Size and Weight of Elephants. The African Elephant is, on the average, rather larger than the Indian ; but the height seldom exceeds eleven feet, a bull of that size being considered a real prize by sportsmen. The biggest specimen ever seen in this country, the still famous "Jumbo," formerly exhibited in the Zoological Gardens, was estimated to be between ten and a half feet and eleven feet. It is a very big bull Indian Elephant that reaches ten and a half feet, although there are dubious records of specimens reaching eleven feet. Cows of both species are always smaller, from seven to nine feet being about their height.

A rough and ready, although not strictly accurate, method of estimating the height of an elephant is practised in India by taking the circumference of a fore foot, which, surprising as it may seem, is about half the height

SIZE AND WEIGHT OF ELEPHANTS

sometimes more. In the African Elephant, the foot is relatively smaller, its circumference being less, sometimes considerably less, than half the animal's height.

The difficulties of weighing elephants are obvious. There are, however, a few records. A bull measuring ten feet, killed in South Africa, was said to be nine thousand eight hundred and sixty pounds. Of Jumbo's



[Lt. Col. F. D. S. Fayer.

AN INDIAN ELEPHANT (*Elephas maximus*) WITH UNUSUALLY LONG TUSKS.

The biggest pair, from an Asiatic elephant, of which there is a trustworthy record, measured eight feet nine inches and eight feet six and a half inches respectively, with a basal girth of about twenty-two inches and a combined weight of two hundred and twenty-two pounds.

weight there are two discrepant records, namely eight thousand nine hundred and sixty, and fourteen thousand five hundred and sixty pounds! An Indian bull and cow in New York turned the scale at six thousand eight hundred, and four thousand five hundred pounds respectively; but these must have been immature animals. Another bull eight feet high weighed just under six thousand four hundred pounds, and a cow seven and a half feet high, a little over five thousand seven hundred pounds.

Tusks. The tusks in bulls are always larger on the average than those of cows; but they may be short, and slender and project only a few inches

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beyond the jaw in both sexes, especially in Ceylonese and Indian Elephants ; and they are usually better developed in the African than in the Asiatic species. They are also subject to individual variation in size from use, one being frequently longer than the other. In the Asiatic Elephant good tusks run from six to eight feet long, measured along the convex curve, with a combined weight of from one hundred to two hundred pounds. The biggest pair of which there is a trustworthy record measured eight feet nine inches and eight feet six and a half inches, respectively, with a basal girth of about twenty-two inches and a combined weight of two hundred and twenty-two pounds. In the African Elephant, the longest known pair were eleven feet five and a half inches and eleven feet, with a girth of eighteen and a half inches, and a combined weight of two hundred and ninety-three pounds. But another pair with a length of about nine feet had a girth of twenty-five and twenty-three and a half inches, and a combined weight of three hundred and seventy-two pounds ! The measurements, it may be added, are taken after extraction from the jaw, the imbedded root amounting to one foot or more.

Age. Elephants are slow breeders, the period of gestation being twenty or twenty-one months, and only a single calf, as a rule, is born at a time. The calf is soon capable of accompanying its mother and suckles with its mouth, the teats of the mother, two in number, being between her fore legs. Maturity is reached in about twenty-five years, and the natural duration of life is probably about the same as in man, say seventy years, although it was formerly believed to be anything from one hundred and fifty to two hundred years. The old saying that an animal is as old as its teeth expresses the idea that it is dependent on them for its existence. Now the sixth and last tooth of an elephant comes into use when the animal is about forty years old—that is to say, five teeth have been disposed of during that period of the creature's life. The last tooth, it is true, is the largest and doubtless the longest in use of the set, but it is impossible to believe it can endure for a century or more to carry the creature to the great age at one time claimed for it.

A particular case may be cited to illustrate this point. An Indian Elephant presented by King Edward VII to the Zoological Gardens died in 1917, when she was known to be about fifty years old. Her last tooth had then been in use about ten years and about one-third of it had been worn away, although throughout her life she had been fed upon hay, bran and other foods much softer than the woody fibre she would have eaten in a wild state. If she had lived and the rate of wear above stated had continued, her last tooth would have come to an end, and her life probably with it, in another twenty years. She would then have been only about seventy and would have died of old age. Hence it may be inferred that three score years and ten is the approximate span of an elephant's life. It must be added, however, that the life of a tame and toothless elephant

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might be artificially prolonged by feeding it on soft food requiring no mastication. This may, perhaps, account in part for the stories of excessive longevity based upon captive specimens in India, where elephants are often held sacred and are always greatly prized.

Habits. Apart from a few minor differences, the habits of African and Indian Elephants are very similar.

Like most herbivorous mammals, they are gregarious, the herds being composed of a varying number of individuals, from about a dozen up to fifty or sixty, according to the suitability of a locality, but the huge herds



[Aerofilms.]

AFRICAN ELEPHANTS IN A SWAMP STAMPEDING AT THE APPROACH OF AN AEROPLANE.
The herds are composed of a varying number of individuals, from about a dozen to fifty or sixty, according to the suitability of the locality.

of a hundred or more that used to be reported are seldom encountered nowadays. Solitary bulls are not infrequently met with; and about these "rogues," as they are called in India, much has been written and considerable difference of opinion prevails. Some maintain that they are undesirables expelled from the herd and compelled to live a life of solitude, which has soured their tempers and made them vicious. Others think they are merely bolder individuals, which, regardless of the safety which lies in numbers, have voluntarily separated themselves temporarily from their companions. They have the reputation of being more dangerous to man than bulls in a herd, and are said often to attack without provocation.

Being vegetable feeders needing plenty of food and water, elephants

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are always found in jungle, forest or bush, never far from rivers, streams or pools, sometimes at considerable altitudes, sometimes in the plains, and they frequently pass from one watering place to another, travelling long distances through the woods and plains, as occasion demands.

When on the move, the herd marches, as a rule, in single file and keeps to beaten tracks. Wherever, indeed, these animals have sojourned, the country is traversed in all directions by "elephant-paths," known to sportsmen by their hard, smooth surface, the result of the passage year after year of hundreds of feet over them. Since elephants are fearless of water and excellent swimmers, rivers are no barrier to their progress; and when crossing a river, they sink deep below the surface with only the top of the head and the end of the trunk above it. One obstacle they cannot cross, on account of their inability to leap, is a deep ditch too wide to stride across.

The ease with which they climb up and down steep slopes is surprising considering their bulk and ungainly build, and they will sometimes descend a smooth decline, sliding on their bellies with their legs stretched out in front and behind.

More surprising still is the silence with which they can travel even through the bush. Over open ground they can walk without a sound, so soft and light is the tread of the cushion-like pads of the feet.

Sportsmen with experience of elephants in the wild are agreed regarding their general timidity and the alacrity with which they make off the moment danger threatens. Their hearing and sight are comparatively poorly developed, but their power of scent is unusually keen. Stalking them with success is, therefore, exceedingly difficult unless the wind is in the right direction. But pacific as elephants are as a rule, a wounded bull is one of the most dangerous beasts in the world; and the cows, when calves are with them, are apt to charge when quite unmolested.

The habitual method of drinking of elephants is unique. Water is sucked up into the trunk and blown down the throat from the back of the mouth. By this means they can get the water required from a shallow pool or stream to which they cannot lower their heads. But at times they slake their thirst by wading into a river and gulping the water with the mouth.

Food. Their food consists of foliage, grass, canes, fruit, bark, tubers and the like. Branches and foliage can be stripped at a height of twelve or fifteen feet from the ground, and bark is pulled off in long strips with great precision by the trunk. The tusks, helped sometimes by the fore feet, are also used for turning over and loosening the soil for tubers. But much rich foliage and tempting fruit grows out of reach; and to secure it, entire trees are felled by pressing with the head after the roots have been broken or exposed by means of the tusks. Usually, it seems, the right tusk is used, but sometimes the left, and the preference of one or the other as a tool accounts for the discrepancy in the length of the two tusks above

FOOD OF ELEPHANTS

described. Not infrequently the tusks get broken off by being used for that purpose. Elephants with one or both tusks fractured are often shot



[W. F. Taylor.]

INDIAN ELEPHANTS (*Elephas maximus*) AT HOME.

The Indian Elephant has a high, bulging forehead, comparatively small ears covering the sides of the neck, and the tip of the trunk provided above with a finger-like lobe, which closes down on the square cut lip-like lower rim.

and now and again hunters have found pieces of tusk a foot or more in length jammed in the ground under an obstinate root.

It is impossible to find out how much food and water a wild elephant

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takes daily. This can only be inferred from experience with captive specimens. A big elephant in captivity, fed upon dry food, like hay, bran and grain, will drink forty or fifty gallons of water a day, and requires a minimum ration of about one hundred and fifty pounds weight of food to keep it in fair condition. But tame elephants in India will daily consume from six hundred to seven hundred pounds of green food, which weighs much more than dry hay.

Voice. With the help of the trunk elephants utter a great variety of sounds, blowing that organ to clear it being the simplest. The loudest is a shrill blast called "trumpeting." The roar produced in the throat somewhat resembles that of the lion. There is also a deep, growling rumble sounding as if produced far down in the chest.

Intelligence of Elephants. The elephant has a world-wide fame for its capabilities as a servant and companion of man, and for the extraordinary development of its intellectual faculties. They are, admittedly, exceedingly tractable and can probably be more easily and rapidly tamed than any other wild animal; and they can be readily educated to respond to words and gestures of command and to perform actions which suggest complete understanding of what they are about or what is required of them. But in the wild state, according to the records of sportsmen, they evince no more intelligence than other wild beasts, their wariness of man or method of felling trees being indications merely of particular instincts conducive to success in their natural environment; and when these instincts, coupled with innate skill in the use of the trunk, tusks and feet for a variety of purposes, are transferred to the new conditions of captivity, the capabilities and general behaviour of elephants have earned for them their reputation for cleverness. The caution, for instance, with which they test a frail-looking bridge before venturing on it has been ascribed to intelligence; but it is nothing more than obedience to an instinct prompting them to tread warily on strange, untested ground lest it yield like a pitfall to their weight.

But although their intelligence is not of so high a standard as has sometimes been claimed, a considerable measure of it cannot be denied them. An illustration may be observed any day in the Zoological Gardens. If a visitor drops a piece of bread between the barrier and the cage and out of his own and the elephant's reach, the beast with his trunk will blow the piece, if necessary more than once, towards the visitor's feet, knowing, apparently, that the gift of it will be his reward. The elephants have not been taught this trick. They have found it out for themselves. And since it is difficult to imagine circumstances in the life of wild elephants that could implant the instinct to behave in that way, intelligent seems the only suitable term to apply to the action.

Domestication. Elephants were trained for man's service at an early historic period; and this applies both to the Indian and African species,

EXTINCT ELEPHANTS

as is attested by ancient coins and medals. The African was employed for warfare and other purposes at the time when it inhabited the northern part of the Continent ; and it was this elephant that Hannibal took with him across the Alps in his invasion of Italy from Spain. Later the long-continued importation of specimens to Italy for processions and wild beast contests in the amphitheatres, and the incessant demand for its ivory, were probably accessory factors in its extermination in the countries to the south of the Mediterranean. With its disappearance from those countries, it ceased to be a domesticated animal ; and until recently it was commonly believed by Europeans in Africa to be untameable, despite the evidence to the contrary supplied by menagerie specimens that it is as docile as its Indian relative. The Belgians in the Congo were the first to take it in hand and are now training it for work which no beast of burden can do so effectively in that country.

In the East the Indian Elephant from times immemorial has played an important part in human affairs, for warfare in the past and at the present time for haulage, vehicular work, processions, tiger-shooting, forest-clearing and so forth. Good and showy elephants have always been prized by their owners ; but the most valued of all, even to this day, is the "white elephant," which seems to be of commoner occurrence in Burma and Siam than elsewhere. The albino variety was regarded with the greatest veneration ; and it is said that the coveted possession of one in Siam in the seventeenth century kept three nations at constant war for nearly a century and caused the death of five kings and thousands of soldiers.

Some Extinct Elephants. The two kinds of elephants now living are the sole survivors of a great population of these huge beasts that in comparatively recent times roamed over the greater part of the northern hemisphere, in Europe and Asia, and invaded even North America. Their remains, indeed, are frequently found in the Thames gravels and elsewhere in England. The best known of these is the Woolly Mammoth, first cousin to the Indian Elephant, but a little smaller in the body, with weaker quarters, and a shorter tail, although the head was relatively larger to support the gigantic tusks which curved forwards and inwards in front of the head, their points sometimes actually crossing so that they could not be used for uprooting trees. The tusks, indeed, were not required for that purpose because this elephant inhabited the grassy tundras of Siberia, as far north as the shores of the Arctic Ocean, where the trees are mostly stunted or scrub-like. The Mammoth carried in winter a coat of woolly fur covered with coarse hair, sometimes a foot-and-a-half long, long enough almost to sweep the ground, and under the skin was a layer of fat some three inches thick ; and as a further provision against the winter, when the grass and low herbage on which he fed was buried deep under frozen snow, he laid up in the autumn stores of fodder, sufficient, with the

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fat which was gradually absorbed, to carry him through the long, cold period. Such stores of food and splendidly-preserved skeletons, with portions of the skin and hair adhering, have been found in Siberia, buried in ice. So abundant was this elephant that since the dawn of history its tusks have been valuable commercial commodities for the peoples who lived near his home.

Some of the extinct elephants of recent geological times were bigger even than the African Elephant, standing thirteen feet or more at the shoulder; but in Cyprus and other Mediterranean islands, there were dwarfed elephants, representing the African type, no taller than small ponies.

Evolution of the Elephant. The wonderful story of the evolution of the elephants may be briefly told. As their skeletons are traced back in time, all the peculiarities of the type gradually disappear. The huge bulk and globular head dwindle, the jaws lengthen, the teeth become simplified, until finally we reach an animal somewhat resembling a tapir in build, with tusks in the front of both jaws and molar teeth like those of ordinary herbivorous hoofed mammals; and this creature, evolved in Africa, showed many points of resemblance to the order shortly to be described, the Hyracoidea.

Order SIRENIA (Manatees and Dugongs)

The singularly inappropriate term for the ugly, ungainly mammals of this order, an offshoot from the stock of the Elephants and Coneys, is derived from the belief that the Dugong of the Indian Ocean was responsible for the ancient fables of mermaids and sirens.

In adaptation to aquatic life, the sirenians are surpassed amongst Mammals only by the Cetaceans, which they resemble in shape, in the absence of hind limbs, flipper-like fore limbs, the presence of a horizontal tail-fin, small eyes and loss of the ear-conch. In other respects, however, the head is very different from a Cetacean's, the muzzle being rounded and blunt and provided with a cleft, muscular, bristly upper lip by means of which water-weeds, on which these animals feed, are plucked from the bottom and passed backwards into the mouth to be masticated by broad-crowned cheek teeth. In the Manatee (*Trichechus*) there are eleven of these teeth and they succeed one another along the jaw, as in elephants, six, as a rule, being functional at a time.

Sirenians are surprisingly skilful in the use of their flippers, employing them not only to direct food to the mouth and to paddle and balance in the water, but also for holding the solitary helpless young to the breast to suckle, the teats, as in Elephants, being close to the fore limbs. This human method of nursing was one of the inspirations of the mermaid fable.

The Manatee inhabits the Atlantic rivers of tropical Africa and America, the African species (*T. senegalensis*) and the Common American species

AARD-VARK (ORDER TUBULIDENTATA)

(*T. americanus*) being the best known. In these animals the tail is rounded, there are no front teeth and the jaws are not bent downwards. The length is about eight feet.

The Dugongs (*Halicore dugong* and *H. australis*) inhabit respectively the Indian Ocean and the Australian Seas. They are never found far from shore and feed on seaweeds. They differ from the Manatees in having the tail shaped like a whale's flukes and the jaws bent downwards to accommodate a pair of tusks, which in the male have a sharp cutting edge and grow through life, like those of an elephant. Dugongs are about the same size as Manatees.

Order TUBULIDENTATA (Aard-vark)

The Aard-vark (*Orycteropus*), also known as the African Ant-bear, is a strange beast whose organization suggests its descent from the same ancient stock as that which gave rise to the Elephants and Sirenians. It is not related to the American Anteaters, with which it was formerly classified.

It is an ungainly beast, with a long, narrow head, a pig-like snout, donkey-like ears, a muscular tail, and strong legs armed with powerful digging claws; with these it demolishes the white-ant mounds to feed upon the insects, which it licks up with its long, extensile tongue. The mouth has no front teeth, but the cheek-teeth



[W. S. Berridge.]

AARD-VARK OR AFRICAN ANT-BEAR (*Orycteropus*).
With its powerful digging claws, the animal demolishes white-ant mounds and feeds upon the insects, which it licks up with its long, extensile tongue.

are quite unlike those of any other Mammal, being composed of a number of closely-packed denticles, each with a pulp cavity and radiating tubules.

There are several species found in different parts of Africa south of the Sahara, the best known being the typical Aard-vark (*O. afer*) of Cape Colony, which is yellowish-brown in colour, its head and body measuring four and a half feet and the tail two feet. It is solitary and nocturnal, lying up by day in its own deep burrows, sometimes hollowed out in a white-ant mound. Although very powerful, it is quite defenceless, depending for safety upon the quickness of its hearing and a speedy retreat to shelter the moment danger threatens.

Order HYRACOIDEA (Coneys)

There is no popular name for the animals of this Order except the biblical term Coney, which belongs by rights to the rabbit, an animal which they superficially resemble in size, colour and shape, apart from their short ears. By their teeth



[W. S. Berridge.
ROCK-CONEY OR HYRAX (*Procavia capensis*).
This lives on the Kopjes and hill-sides of the open districts of Africa and south-western Asia.

and other characters Coneys belong to the stock to which the elephants trace their descent, a lineage no one would suspect from their appearance and habits. They have a complete set, which no rodent possesses, of large cheek-teeth, like those of the rhinoceros, and tusk-like incisors in front of the mouth, but no canines; their feet are naked beneath and the toes, except one, have hoof-like nails, the exception being the inner toe of the hind foot, which carries a claw used as a scratcher to clean the fur. There also is a large scent-gland on the back marked by a patch of black or whitish hair.

There are two distinct kinds, the Rock-coney (*Procavia*) and the Tree-coney (*Dendrohyrax*), forming the Family *Procaviidae*, found in Africa, Arabia and Syria.

The Rock-coneys, resembling Marmots in habits except that they shelter in crevices and not in their own burrows, live on the Kopjes and hill-sides of the open districts of Africa and south-western Asia and feed on leaves and shoots of small shrubs. They are skilful climbers and extraordinarily active and wary. The young, usually three in number, are born in the shelters the parents occupy. There are many different species, the

most commonly imported being the Cape Coney (*P. capensis*), known to the Dutch of South Africa as the "Dassie." The Syrian Coney (*P. syriaca*) is now very rare.

The Tree-coneys live in the loftiest trees of the forests of Central Africa, and shelter in holes in the trunks. Their loud, weird cries at night carry for miles through the forest. As a rule, they are short-lived in captivity even in Africa, and one species only, the Gold Coast Tree-coney (*D. dorsalis*), has been imported.



[D. Seth-Smith.
TREE-CONEY (*Dendrohyrax dorsalis*).
This animal lives in the loftiest trees of the forests of Central Africa, and shelters in holes in the trunks.

• Order RODENTIA (Gnawing Animals)

The Rodents differ essentially from the Insectivora (page 824), which they approach in their generally low organization, by the structure of the mouth and teeth. There are never more than two functional incisor teeth in the upper and lower jaws and these are of large size, chisel-like, adapted for cutting hard substances, of permanent growth, and separated by a long space from the cheek-teeth, there being no canines. This space is filled by flaps of skin, growing inwards from the cheek, which can be separated for swallowing but serve to prevent indigestible, gnawed fragments passing back to the throat.

The Rodents have successfully adapted themselves to the most varied conditions, and exhibit great diversity in structure and habits. They are found practically all over the world and, apart from the Bats, are the only indigenous placental mammals found in Australia.

The Order is divided into two suborders, the *Duplicidentata* (Double-toothed Rodents) and the *Simplicidentata* (Single-toothed Rodents).



RABBIT (WILD) (*Oryctolagus cuniculus*) AT HOME. [A. H. Willford.]

CLASSIFICATION OF THE RODENTIA.

Suborder DUPLICIDENTATA [DOUBLE-TOOTHED RODENTS] (Hares and Rabbits).

Suborder SIMPLICIDENTATA (SINGLE-TOOTHED RODENTS).

1. **Squirrel Tribe** (Squirrels, Marmots, Beavers, etc.)

2. **Mouse Tribe**

Family *Muscardinidae* (Dormice)

Family *Muridae*, Murines (Rats and Mice), Cricetines (Hamster),
Microtines (Voles, Lemming)

Family *Spalacidae* (Mole Rats)

3. **Jerboa Tribe**

Family *Jaculidae* (Jerboas, Jumping Mouse)

Family *Anomaluridae* (African Flying Squirrels)

Family *Pedetidae* (Cape Jumping Hare)

4. **Porcupine Tribe** (Porcupines, Chinchillas, Cavies, Agutis and Capybara).

MAMMALIA (ORDER RODENTIA)

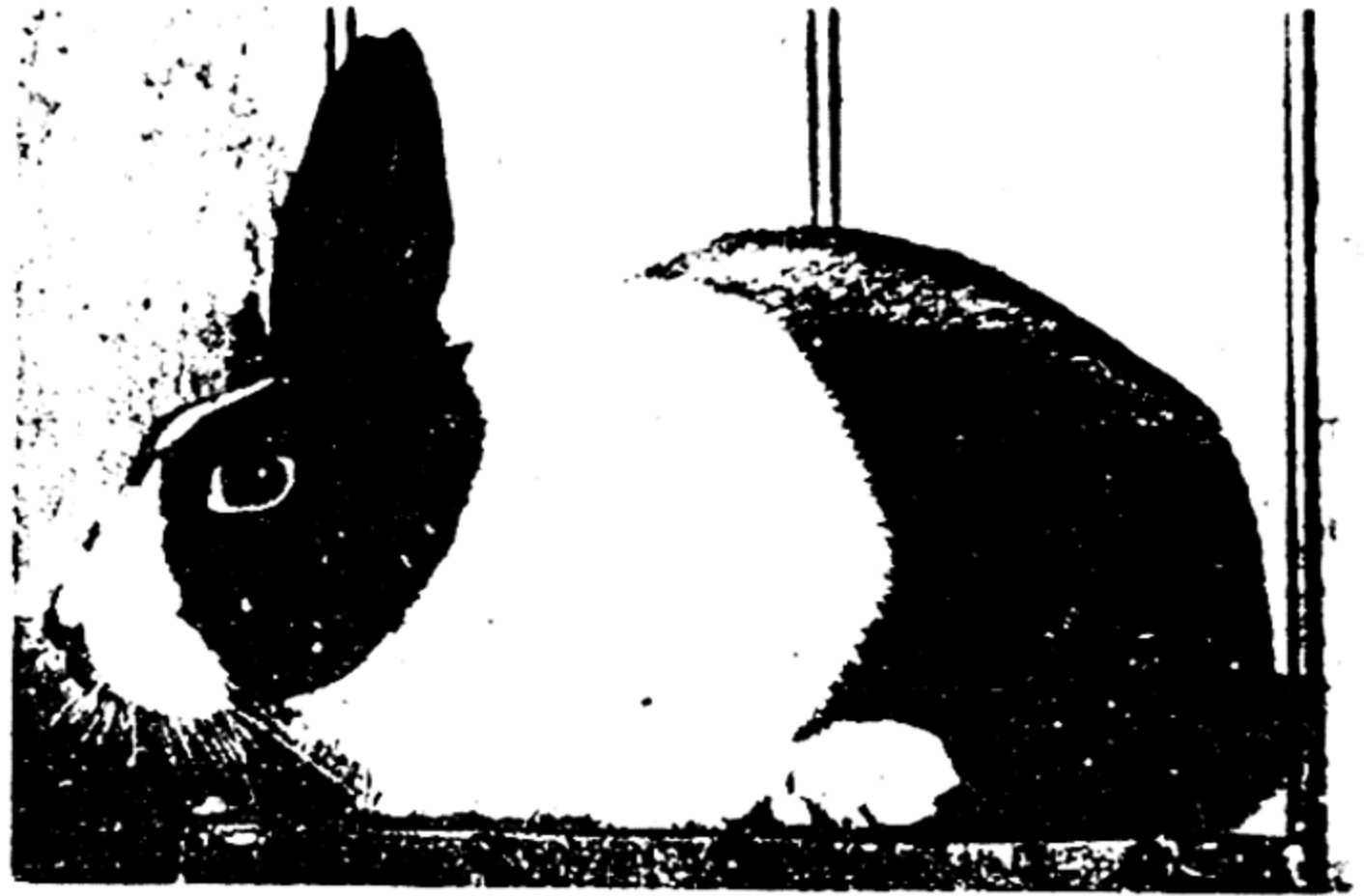
Suborder DUPLICI- DENTATA (Hares, Rabbits and Picas)

These Rodents are distinguished by the presence in the upper jaw of a pair of minute incisors behind the large pair, and the enamel of the latter is not restricted to the front edge. The soles of the feet are always hairy and the tail is short or absent.

There are two families, the Picas (*Ochotonidae*) and the Hares and Rabbits (*Leporidae*).

The Picas (*Ochotona*), sometimes called Mouse-hares or Calling-hares, which are not unlike guinea-pigs, have short ears, no tails and no scent glands in the groin. They are gregarious, living in burrows and rock crevices in cold districts of Central Asia and North America, and have a peculiar piping call. For the winter they lay up stores of food, but do not hibernate. The young, about six to the litter, are born naked, as in rabbits. There are many species. Royle's Pica (*O. roylei*) from the Himalayas, the Siberian (*O. alpina*) and the Rocky Mountain Pica (*O. princeps*) may be cited as examples.

In the Hares and Rabbits (*Fam. Leporidae*) the ears are stalked, the tail is present, and there is a pair of scent glands in the groin. The family is widely spread in all the continents, from the Arctic southwards, but it is not found in Madagascar or Australia.



DUTCH RABBIT.



There are many different kinds to which the names Rabbit and Hare are indiscriminately applied.

Common Rabbit (*Oryctolagus cuniculus*). This species is gregarious, typically living in extensive burrows, called "warrens" in which the numerous young, naked and helpless at birth, are born. It is found in Central and Southern Europe, but its general appearance is too

[Photos]

ANGORA RABBIT.

[Sport & General.

RABBITS AND HARES

well known to need description. It has been introduced into several countries, notably Australia and New Zealand, where it has proved an unmitigated pest to farmers, although considerable revenue is derived from its skins, which are dressed in imitation of more valuable furs, the suffix or prefix "coney" indicating their real nature. The wild rabbit is the source of all domesticated breeds, of which the so-called "Belgian Hare" is the largest.

Several exotic species are regarded as Rabbits rather than as Hares, notably the North American "Cotton-tail" (*Sylvilagus floridanus*, etc.), which produces naked young in burrows.

Hares differ from Rabbits in habits. They are not gregarious and do not burrow, but lie up in a kind of nest, called the "form," in which the small litters of young, covered with hair and with the eyes open, are born. For safety they depend largely on speed of foot and endurance, requiring the intake of large volumes of air. Hence the nasal passages are much more spacious than in Rabbits, which bolt to their burrows when chased. In the Hares the ears and hind limbs are also much longer than in the Rabbits.

English Hare (Lepus europaeus). This Hare is much larger and has longer ears and legs than the Rabbit. Its summer coat is also redder; but frequently turns grey in winter. It entered Great Britain from Western Europe and spread to Scotland, but failed to reach Ireland, although it has been artificially introduced there.



[Charles Reid.]

COMMON ENGLISH HARE (*Lepus europaeus*).
This hare entered Great Britain from Western Europe and spread to Scotland, but failed to reach Ireland, although it has been artificially introduced there.

MAMMALIA (ORDER RODENTIA)



[Capt. Knight (Mondiale).]

BRITISH RED SQUIRREL (*Sciurus vulgaris*).

This ranges from Ireland into Asia, and is the only indigenous species in the British Isles.

Scotch or Mountain Hare (*L. timidus*) is smaller, browner and has shorter ears and tail. Being somewhat intermediate in appearance between the English Hare and the Rabbit, it has been mistaken for a hybrid between these two species, which, however, never interbreed. It entered Scotland from the north and was originally confined to the Highlands, but has been introduced into the Lowlands, where it sometimes crosses with the English Hare. It is a race of the North European species, known as the Blue

Mountain, or Variable Hare, which typically turns white in winter, the tips of the ears alone remaining black.

Irish Hare (*L. t. hibernicus*). This represents another race, and is larger and redder than the Scotch Hare and seldom shows signs of turning white in winter.

Another species besides the Variable Hare turns white in winter, namely the *Prairie Hare* (*L. campestris*), one of the North American White-tailed "Jack Rabbits." The *Polar Hare* (*L. arcticus*), of the same continent, seems, on the other hand, to be white all the year round. Other Hares from the States, known as the *Swamp Rabbits* (*Limnolagus aquaticus* and *L. palustris*) are interesting from their habitat being marshy localities. In this respect they offer the greatest contrast to the *Arabian Hare* (*L. arabicus*), which frequents sandy deserts. Many other species, resembling the English Hare in habits, are found in India and Africa.

Suborder SIMPLICIDENTATA (Single-toothed Rodents)

This suborder includes Rodents with only one pair of upper incisor teeth, in which the enamel is restricted to the front edge.

There is a large number of families and subordinate groups mainly distinguished by technical characters in the skull, which cannot here be

THE SQUIRREL TRIBE

described ; but as a matter of convenience, the species may be assigned to four sections : the Squirrel Tribe, the Mouse Tribe, the Jerboa Tribe and the Porcupine Tribe.

The Squirrel Tribe

It will be understood that the Squirrels form a very large group and that it will be possible to mention here only a few of the more interesting and representative species.

Arboreal Squirrels. The typical Squirrels, which have long, bushy tails, are expert climbers, although quite at home on the ground. They are diurnal, active throughout the year, feeding mainly on fruits, nuts, buds and seeds, varied with eggs, young birds and sometimes insects. The young, usually three or four in number, are born in nests of leaves lodged in a hole or forked branch of a tree. There are many different kinds found to the limits of tree-growth all over the world except Australia and Madagascar.

Common Red Squirrel (*Sciurus vulgaris*). This ranges from Ireland into Asia, and is the only indigenous species in the British Isles. In this country it is foxy-red in winter, with tufted ears ; but in summer the tufts are moulted and the colour becomes greyish-brown, the tail at all seasons being



[Charles Reid.
NORTH AMERICAN GREY SQUIRREL. (*Sciurus carolinensis*).
This was imported into Great Britain some years ago, and is proving a great pest by destroying the eggs and fledglings of our song-birds.

MAMMALIA (ORDER RODENTIA)

paler. The head and body measure about nine inches and the tail seven inches. It was formerly much more plentiful than now; and its disappearance has been ascribed, not altogether justly, to the larger North American Grey Squirrel (*S. carolinensis*), which was imported some years ago and is steadily spreading all over the country and proving a great pest by destroying the eggs and fledglings of our song-birds. Many tropical Squirrels are beautifully coloured, a particularly handsome species, and the largest of all, being the Great Indian Squirrel (*Ratufa indica*), which is nearly three feet long from the snout to the tip of the tail and offers the greatest contrast to the pretty little Palm Squirrel (*Funambulus palmarum*), which is less than one foot in total length and is brown, banded with white.



AMERICAN GROUND SQUIRREL OR CHIPMUNK (*Tamias*).
This squirrel lives in burrows in woods, and differs from ordinary squirrels in having cheek-pouches.

[James's Press.]

Ground Squirrels. Rather similar to the Palm Squirrels in pattern and size are the Chipmunks, or Striped Gophers (*Tamias asiaticus*, etc.), found in eastern Asia and North America. They live in burrows in woods, and differ from ordinary squirrels in having cheek-pouches. The Sousliks (*Citellus citellus*, etc.) are allied to the Chipmunks, but live

in the open plains of Europe, Asia and North America.

Marmots. The Sousliks connect the Squirrels with the Marmots, which may be regarded as heavily-built Ground Squirrels with short, not bushy tails. They inhabit Central Europe and Asia and North America and live in colonies in burrows, coming out, usually in the morning and evening, to feed. When abroad they are extremely wary, one or more of the company acting as sentinels to warn the rest of the approach of danger. The species frequenting cold districts sleep through the winter. Of the typical Marmots there are many different kinds, perhaps the best known being the Alpine Marmot (*Marmota marmota*), in which the head and body measure about two feet and the tail six inches; and the North American Woodchuck (*M. monax*), which has the tail of about the same length but the head and body only one foot long. Closely related to the true Marmots and resembling them in habits is the "Prairie Dog" or Prairie Marmot

MARMOTS AND FLYING SQUIRRELS

(*Cynomys ludovicianus*), which inhabits the North American Prairies, sometimes occurring in such numbers that their burrows cover acres of land, constituting what is called a "town."

The Arboreal Squirrels, Ground Squirrels and Marmots constitute the family *Sciuridae*.

Flying Squirrels. The Flying Squirrels form a second family (*Petauristidae*), distinguished by

the presence of a wide flap of skin stretching between the fore and hind limbs on each side and supported in front by a rod of cartilage jointed to the back of the wrist. By means of this parachute they are able to glide some distance through the air from tree to tree. These are not so active either in trees or on the ground as ordinary squirrels and further differ from them in being purely nocturnal. Otherwise their habits and diet are very similar. They are found in Europe, Asia and North America and are represented by a large number of different kinds varying in size and



[Chase (Dorion Leigh).]
NORTH AMERICAN WOODCHUCK (*Marmota monax*).
 Marmots are extremely wary, one or more of the company acting as sentinels to warn the rest of the approach of danger.



[W. S. Berridge.
EUROPEAN SOUSLIK (*Citellus citellus*).
 The Sousliks are allied to the Chipmunks, but live in the open plains of Europe, Asia and North America.

other respects, those from tropical Asia being the largest. For instance, the large brown Indian Flying Squirrel (*Petaurista philippensis*) may measure one and a half feet long from the nose to the root of the tail, the tail being nearly two feet. It can pass from tree to tree over a distance of sixty or eighty yards. On the other hand, the common North American species (*Glaucomys volans*) and the

MAMMALIA (ORDER RODENTIA)

European species (*Sciuropterus russicus*) are smaller, the latter, found in Scandinavia, Russia and northern Siberia, being about one foot in total length, of which the tail is about five inches.

Beavers (Family *Castoridae*). The Beavers form another family and are not unlike huge Marmots; but may at once be distinguished by their wide, scaly, paddle-like tails and fully-webbed hind feet adapting them for aquatic life.



[W. S. Berridge.

ALPINE MARMOT (*Marmota marmota*).

Marmots live in colonies in burrows, coming out, usually in the morning and evening to feed.

There are two species, the European Beaver (*Castor fiber*), which still survives in small numbers in the Rhone, Elbe and in Norway and in Central Asia, and the American Beaver (*C. canadensis*), which is widely distributed in North America, although killed out in many places where it was formerly plentiful. The two species are very similar, both being covered with thick, brown fur impervious to water. A full-grown beaver measures about two and a half feet from the nose to the root of the tail, the tail being one foot, and the average weight is about forty or fifty pounds. The span of life is from twelve to fifteen years. The young, generally four in number, are born in the spring in a burrow or lodge.

The European beaver lives, like a water-rat, in burrows in the banks of streams, seldom indulging in the engineering feats for which its American ally is famous. These operations are designed for the protection of the colony from enemies, of which the cougar and wolverine, apart from man, are the most formidable, and as a safeguard against frosts. The most important work is the "dam," which, by blocking the flow of a river, produces a "pond" of deep, still water, sometimes causing it to overflow

BEAVERS

the adjoining land, forming a "beaver-meadow." The dams are laboriously built-up of logs and branches, plastered with mud to stick them together and fill up interstices. To get the necessary woodwork, the beavers fell the nearest trees by gnawing through the trunk. The tree is then cut up into pieces and transported to the water, small branches being carried and large ones pushed or pulled over the ground. Mud and soil for packing is picked up with the fore paws and carried to the spot, the beaver waddling along on its hind legs and tail. The material is plastered on the dam by means of the fore paws.

When the trees are some distance away, the beavers frequently dig ditches or "canals" from the pond, so that they may themselves travel more safely by water to and from the scene of their tree-cutting and convey the logs more readily by flotation. The "lodges," or homes, are built of the same materials as the dams. Sometimes they are mere piles of branches built over the end of the burrow at the water's edge; but more often they are separated from the burrow as distinct domiciles erected from the bottom of the pond, with the entrance low down beneath the water and the dwelling chamber high up under the roof, which projects some few feet above the surface. In these lodges, sunk in deep water, beavers can live in comparative safety from all enemies, but man, and in the winter, with stored up food, can defy the cold when the surface of



(H. Bastin.
BEAVER'S TEETH (INCISORS) :
FRONT VIEW.



(W. S. Berridge.
AMERICAN BEAVER (*Castor canadensis*).
A full-grown beaver measures about two and a half feet from the nose to the root of the tail, the tail being about one foot.

the pond may be frozen hard. Their food consists mainly of the bark of willow, poplars and other trees, but they also eat water lilies, grass, roots and so forth.

Pocket - gophers (Fam. *Geomyidae*) are members of the Squirrel tribe adapted to subterranean life and are mole-like in general shape, with powerful digging claws. Characteristic of them is a

MAMMALIA (ORDER RODENTIA)



[F. W. Bond.
COMMON DORMOUSE (*Muscardinus avellanarius*).
The dormouse fattens itself on nuts, beechmast and acorns before retiring for its winter sleep.

capacious food-pouch on the cheeks outside the mouth. They live in extensive underground burrows, the best-known species being the Common Pocket-gopher (*Thomomys bursarius*), which is found in the prairies of the United States. The head and body measure about seven inches and the tail two or three inches.

Mouse Tribe.

These Rodents are more numerous in species, more widely distributed and more varied in habits than the others, but on the average they are comparatively small animals resembling ordinary rats and mice. There are, however, many marked deviations from the usual type. The Rodents found in Madagascar and Australia belong to this tribe.

Dormice (Fam. *Muscardinidae*). These recall diminutive squirrels in their diet, arboreal habits and hairy tails. They are, however, nocturnal and hibernate, at least in cold temperate latitudes. They inhabit Europe, Africa and Central Asia.

The Common English and Continental Dormouse (*Muscardinus avellanarius*) is about the size of a house-mouse, but is fawn in colour and has the tail well haired. It is found in thickets and hedges, and fattens itself on nuts, beechmast, and acorns before retiring for its winter sleep, which is spent in a compact nest of leaves, sometimes on



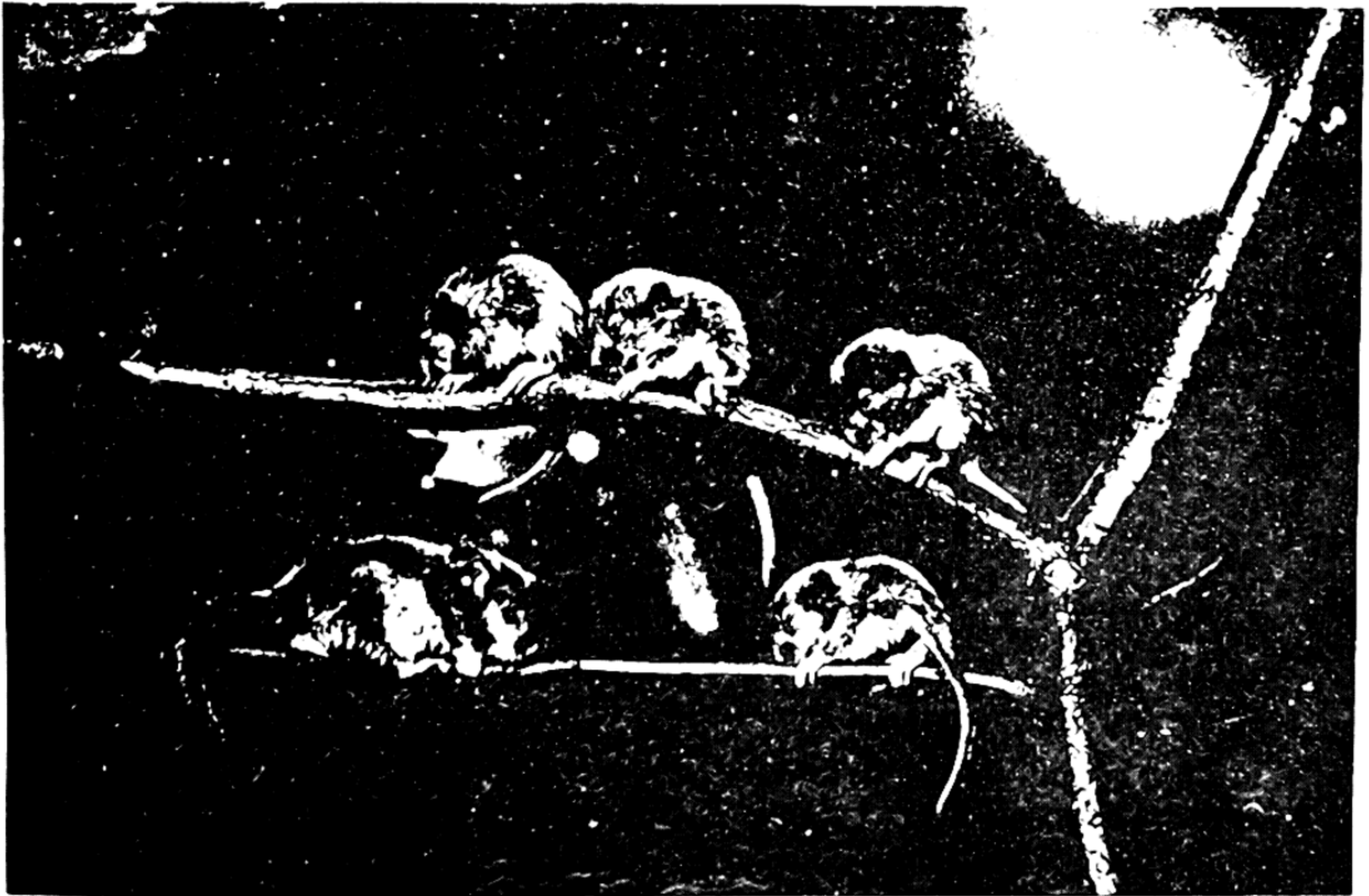
[James's Press.
SQUIRREL DORMOUSE (*Glis glis*).
This little animal takes its name from its size and bushy tail.

DORMICE (FAMILY MUSCARDINIDAE)

the ground. In the spring the female builds a breeding nest for her young, usually in a bush.

In Europe there are several other kinds of dormice, the largest being the Squirrel Dormouse (*Glis glis*), so named from its size and bushy tail. It has been recently imported and has established itself in Herts and Bucks, where it is known locally as the chinchilla. It is a savage species and usually nests in holes in trees. Two other species are found in Europe and several others throughout Africa and Asia.

Muridae. This family contains an immense number of species known



[Rudolf Zimmermann (Sächsische Landesbildstelle).
A FAMILY OF DORMICE.

as Rats, Mice, Hamsters, Voles, etc., which mostly have slender, sparsely-haired, scaly tails and short feet. Only a few of the more interesting can be mentioned.

In our country the species belong to the Murine or Mouse Group and the Microtine or Vole Group; but the names "rat" and "mouse" are applied indifferently to both.

Murine Group. The most familiar members of this group, characterized by rooted, cusped cheek-teeth, are the House-rats and House-mouse.

House-rats. We have two species of House-rats, popularly known as the Brown or Norway Rat (*Rattus norvegicus*) and the Black or Old English Rat (*R. rattus*). But none of these titles is appropriate, because the Brown Rat may be black and Norway was not its original home;

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and the Black Rat may be brown and is not Old English in the sense of being indigenous to this country. The Brown Rat reached England from Central Asia about 1730, and proceeded to supplant the Black Rat, which had established itself several centuries earlier and is still to be caught in dockside warehouses of our seaport-towns. Both species are destructive, costly aliens, and may be the carriers of the organism, which, when transmitted to human beings by their fleas, causes bubonic plague.



[John J. Ward.
BROWN OR NORWAY RAT (*Rattus norvegicus*).
This rat is a little larger, has shorter ears and tail, a smoother coat and is much less active than the Black Rat.



[W. S. Berridge.
CAIRO SPINY MOUSE.

The two may be readily distinguished. The Brown Rat is a little larger, has shorter ears and tail, a smoother coat and is much less active. Its tint varies from brown to black or fawn, and it is the original of the tame piebald and white rats of the animal trade. The Black Rat is more elegantly built, and in addition to its much longer tail and larger ears, has long hairs jutting from the shorter coat. The typical colour is not black but slaty-grey; but the brown variety, known as the Alexandrine Rat, is not uncommon. It is an Oriental species and was brought to us in connection with commerce.

House-mouse (*Mus musculus*), which needs no description, is another alien believed to have come from Central Asia, but the date of its importation is unknown. All



[W. S. Berridge.
BLACK OR OLD ENGLISH RAT (*Rattus rattus*).
The Black Rat is more elegantly built than the Brown Rat and has long hairs jutting from the shorter coat.

HOUSE-MOUSE—FIELD-MOUSE

our breeds of fancy mice were derived from it. Except when fighting, House-mice are vocally silent animals; but, now and again, individuals called "singing mice" from the piping notes they utter are recorded. This is due to some pathological affection of the organ of voice.

Another peculiar type, called "waltzing mice" from their peculiar twisting antics, is especially popular in China and Japan. The habit, which is transmitted to offspring, does not seem to be due to any defect in the brain or ear.

Wood or Long-tailed Field-mouse. Of the two indigenous wild mice found in England, the commoner is the Wood or Long-tailed Field-mouse (*Apodemus sylvaticus*), which is abundant in Great Britain and Ireland. It sometimes invades houses, but may be distinguished from the House-mouse by its larger size, reddish back and white belly. It lives in burrows in woods and hedgerows and lays up stores of food for winter use.

Harvest-mouse (Micromys minutus). This is like the Wood-mouse in colour but very much smaller and is further distinguished by its partially-prehensile tail and the modification of its fore feet for climbing. It is unknown in Ireland, but is locally distributed throughout Great Britain.



[James's Press.]

HARVEST-MICE (*Micromys minutus*).

In these mice the tail is partially prehensile and the fore feet are modified for climbing.

MAMMALIA (ORDER RODENTIA)

Meadows and cornfields are its usual habitat. For breeding purposes, in summer it constructs a compact nest the size of a cricket ball by tightly weaving grass-blades together. This is frequently attached to growing corn-stalks a foot or so from the ground.

Cricetine Group. This second group, though unknown in Great Britain, is important from its wide

distribution elsewhere, occurring in Central Europe, Asia and Africa, and in Madagascar and America taking the place of the Murines, from which it differs in having the cusps of the cheek-teeth arranged in two, not three rows. As an example may be taken the European and Asiatic Hamster (*Cricetus cricetus*), a large rodent nearly a foot long, with the tail only two inches in length; it is reddish above but black on the belly. It lives in companies in elaborate burrows containing store-rooms and nurseries. It sleeps through the winter; but, being abundant and prolific, is a great pest to farmers, and it carries food to its burrows in its large cheek-pouches, which it fills with its fore paws. Its skins are extensively used for lining cloaks and overcoats.



[Sächsische Landesbildstelle.
EUROPEAN AND ASIATIC HAMSTER (*Cricetus cricetus*).
This rodent, a foot or so in length, is a great pest to farmers, and carries its food to its burrows in its large cheek-pouches, which it fills with its fore paws.



[W. S. Berridge.
BANK-VOLE (*Clethrionomys glareolus*).
This resembles the Field-vole in size, but is redder in colour.

White-footed Mouse (*Peromyscus americanus*). This mouse, of North America, although in habits and appearance closely resembling our Wood-mouse, belongs to this group. So also does the curious Fish-rat (*Ichthyomys stolzmanni*), which is about as big as a Brown Rat, has webbed feet and a head like an otter's. It inhabits mountain streams in Peru, and feeds on fish.

Microtine Group. The species of this group may

WATER-RAT—FIELD-VOLE—BANK-VOLE

be distinguished superficially by their small eyes and ears and short tails, and fundamentally by their flat-crowned, unrooted cheek-teeth. The group is not found in Ireland.

Water-rat or Water-vole (Arvicola amphibius), which is much the same colour as a Brown Rat but rather smaller, is the largest British species. It lives in burrows in the banks of streams, is a good diver and swimmer and feeds on roots and a variety of green stuff.

Field-vole or Short-tailed Field-mouse (Microtus agrestis). This is about the size of a House-mouse. It lives in meadows and makes a nest for its young in the grass. It is very prolific, producing three or four litters of some four or five young ones in the season. A peculiarity of this vole, and of its Continental allies, is the occasional prodigious increase in their numbers, causing "vole or mouse plagues"; but in a year or two the normal number for the district is re-established.

Bank-vole (Clethrionomys glareolus). This, the third British species, is commoner than the Field-vole, which it resembles in size, but is redder in colour. It has larger ears, a longer tail, and is more omnivorous in diet.

Of the many exotic species of this group only two of popular interest can be mentioned.

Lemming (Lemmus lemmus). This, in its size, tortoiseshell colouring and very short tail, resembles a half-grown guinea-pig. It is found in Scandinavia, usually in the mountains, where it lives in burrows, and in winter in runs under the snow. Periodical swarms of millions of Lemming are not unusual. At such times they migrate in hordes, keeping a course across country as if impelled to go in one direction, undeterred by crevices, streams or other obstacles. If they reach the coast, blind instinct drives them into the sea to be drowned by the thousand. No satisfactory explanation of this strange behaviour has been given.

Musquash or Musk-rat (Ondatra zibethica). This is the largest of the



[Stanley Crock.]

SHORT-TAILED FIELD-VOLE (*Microtus agrestis*).
This vole is very prolific, producing three or four litters of some four or five young ones in the season.

MAMMALIA (ORDER RODENTIA)

Voles, the head and body measuring one foot and the tail a little less, the colour being rich brown. It inhabits cold temperate parts of North America and is aquatic, its tail being flattened from side to side for swimming. In diet it is omnivorous, eating mussels and fish, as well as vegetable food. Usually it lives in burrows in the banks of streams; but occasionally in still water it builds "huts,"



ZECH'S MOLE RAT (Family *Spalacidae*).
Mole-rats have no visible eyes, or external ears, and the feet are enlarged for digging.

which, like the "lodges" of beavers, project above the surface. Musquash fur is of considerable value; and the animal has been imported into England and the Continent to constitute Musquash-farms. But they have everywhere escaped from confinement and become a menace to the countryside by the weakening of the waterways by their extensive burrows, attempts to keep them in check costing thousands of pounds annually.

Mole-rats (Family *Spalacidae*). These are representatives of the Mouse tribe thoroughly adapted to subterranean life. The body is cylindrical, covered with soft, mole-like fur, there is no tail, no trace of a

neck, the large, wedge-shaped head has no visible eyes, or external ears, and the feet are enlarged for digging. Mole-rats live in underground burrows, feeding on bulbs and roots, and are found in south-eastern Europe and the adjoining parts of Asia and Africa. The Mountain Mole-rat (*Spalax monticola*), from Hungary, Turkey, etc., is brownish in colour and measures about nine inches long.



Photos] [W. S. Berridge.
MUSQUASH OR MUSK-RAT (*Ondatra zibethica*).
The fur is of considerable value; and the animal has been imported into England and the Continent to constitute Musquash-farms.

AFRICAN FLYING SQUIRRELS—CAPE JUMPING HARE

Jerboa Tribe

The Jerboas (*Jaculidae*) are about the size of rats, but are distinguished by their very long hind legs and long, tufted tails, the tuft being black-and-white, whereas the colour is otherwise sandy or pale brown to harmonize with the steppes of central Asia and the deserts of south-western Asia and North Africa, where these animals live, usually in companies. They are nocturnal, lying up in burrows during the day and feeding at night on a variety of vegetable and animal food. In gait they are habitually bipedal, either trotting along on their hind legs or travelling at great speed by means of prodigious leaps several yards in length. There are many species distinguished mainly by the length of their ears and the numbers of toes on the hind feet, these varying from five to three. Two species of North African Jerboas (*Jaculus jaculus* and *Scirtopoda orientalis*), each with three toes, are commonly imported, less well known being the Asiatic five-toed Jerboas (*Allactaga indica* and *Euchoreutes naso*).

The North American Jumping Mouse (*Zapus hudsonius*) in size and appearance is intermediate between the Jerboas and typical Mice. It inhabits woods, plains and even marshland and, although mouse-like in size, can hop eight or more feet.



[D. Selk-Smith.]

ASIATIC FIVE-TOED JERBOA.

These little animals can travel at great speed by means of prodigious leaps several yards in length.

African Flying Squirrels (Family *Anomaluridae*). Although resembling the real flying squirrels (page 737) in habits and in having a flight-membrane, these are not related to them and may be distinguished by the presence of two rows of large, pointed scales at the root of the tail below and by the attachment to the elbow, instead of to the wrist, of the rod supporting the membrane. The scales are used to support the animal when it is resting on a vertical tree trunk; they are, indeed, used as "climbing-irons." There are many species found in the forests of Central Africa, the largest being the Red Flying Squirrel (*Anomalurus fulgens*) from the Gaboon and the Black (*A. peli*) from Guinea. The head and body measure about fifteen inches and the tail seven or eight inches.

Pedetidae. The Cape Jumping Hare (*Pedetes cafer*), known to the Dutch as the Spring Haas, is the sole representative of the Family Pedetidae.

MAMMALIA (ORDER RODENTIA)

Although related to the African Flying Squirrel, this animal is very different in habits and appearance, resembling a small, long-eared, bushy-tailed Kangaroo. The colour is brown; the head and body measure about two feet and the tail one and a half feet. It is gregarious and nocturnal, lying up in burrows by day and feeding on roots, grass, etc., at night. When alarmed, it leaps away at great speed after the manner of jerboas and kangaroos.



DEGU (*Octodon degus*).
This rodent is a native of South America. [W. S. Berridge.]

Porcupine Tribe

The typical Porcupines (Family *Hystriidae*) are distinguished by the armature of long, erectile, smooth, black-and-white spines on the back, by possessing a rattle made of quills or thickened bristles on the tail and by their terrestrial habits, their feet being adapted for running and digging. They are nocturnal and herbivorous, lying up by day in burrows, rock crevices or other sheltered places, and the young, two to four in number, are born, as apparently in all the species of this tribe, with their eyes open, and are soon capable of looking after themselves. They inhabit Africa and southern Asia and a few places in Europe.



CAPE JUMPING HARE (*Pedetes cafer*).
The head and body measure about two feet and the tail one and a half feet. [D. Seth-Smith.]

Crested Porcupine (*Hystrix cristata*). This is found in North Africa, Sicily and Italy, and may be taken as an example of a number of superficially very similar species. The head and body measure two feet, but the tail, without the rattle, which is composed of hollow, inflated quills, is only two or three inches. The spines on the

THE PORCUPINE TRIBE



BRAZILIAN TREE PORCUPINE (*Coendou prehensilis*).
(Family *Erethizontidae*.)

In the Tree Porcupines the feet are adapted for climbing, and the spines are shorter and thinner than in the terrestrial species.

a pungent odour like that of concentrated human perspiration, and they make as much noise as they can by grunting and shaking the rattles in their tails. Their attributes appeal to the sight, hearing and scent of possible enemies, and are sure marks of identity, warning predacious beasts to beware of attacking them.



HODGSON'S LONG-TAILED PORCUPINE.
Porcupines are nocturnal and herbivorous.



[Photos] [W. S. Berridge.]
AFRICAN CRESTED PORCUPINE (*Hystrix cristata*).
These animals emit a pungent odour like that of concentrated human perspiration.

back, which are very stout, sharp and easily detached from the skin, measure from three to twelve inches. They are very efficient defensive weapons; and porcupines surpass even skunks in the arts of self-advertisement. Roaming about in the dusk they are conspicuous by reason of the whiteness of their quills; they emit

Tree Porcupines (Family *Erethizontidae*). These differ from the preceding in being arboreal, with the feet adapted for climbing. The spines, too, are much shorter and thinner and are beset with reversed barbs so that, when they become detached and stick in the skin of an attacking foe, they work inwards and set up festering sores. These porcupines

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MEXICAN TREE PORCUPINE (*Coendou mexicanus*).
(Family *Erethizontidae*.)

are American. The North American species (*Erethizon dorsatum*), found as far north as Canada, has a short, spiny tail with which it strikes when attacked. The best-known South American species, or Coendus (*Coendou prehensilis*, *C. setosus*, etc.), have long, scaly prehensile tails. The quills of these Tree Porcupines are conspicuous when erected, and the animals have the same odour as those of the Old World; but there is no record of their noisiness.

As in the case of the Tree Porcupines, South America is the headquarters of most of the remaining Rodents of this tribe, one or two only, such as the Cane-rat (*Thryonomys swinderianus*) and the Rock-rat (*Petromys typicus*), being African. In South America there are many different species, some of which, like the Degu (*Octodon degus*), closely resemble ordinary rats and mice in size and habits. Others, also of small size, such as the Tucotucos (*Ctenomys magellanicus*, etc.) are like the Mole-rats in being subterranean.

Coypu or *Beaver-rat* (*Myocastor coypus*). This animal belongs to this rat-like section, and is something like a small beaver in appearance, with webbed feet but a rat-like tail, one foot in length, the head and body measuring two feet. It is aquatic, and common in the Argentine, living usually in burrows in the banks of streams and lakes. The young, usually about six to the litter, are soon capable of following the mother into the water, where as many as can find room ride on her back. The teats are set high up on the flanks so that the young can suckle while in the water. Coypu fur, known in the trade as Nutria, is a good imitation of Beaver. Enterprising showmen have sometimes profitably exhibited this animal as a sample of what London can produce in the way of Sewer-rats.



Photos by courtesy of [Curl Hagenbeck's Tierpark, Stallingen.
COYPU OR BEAVER-RAT (*Myocastor coypus*).
Coypu fur, known in the trade as Nutria, is a good imitation of Beaver.

CHINCHILLAS AND VISCACHA

Chinchillas and Viscacha. The next series contains a number of different kinds in which the hind feet are digitigrade, the hock being raised well off the ground. The digits, moreover, exhibit the perissodactyle arrangement, the third toe being median and symmetrically flanked by the second and fourth, which are shorter. There are two main divisions with this type of foot, represented respectively by the Chinchillas, the Cavies and their allies.

The Chinchillas (Family *Chinchillidae*) are distinguished by having moder-

ately long, thick tails, with short hairs below and long hairs above, forming a kind of brush. The Common Chinchilla (*Chinchilla laniger*), well known for the value and beauty of its exquisitely soft silver-grey fur, is about the size of a large squirrel, the head and body being some ten



CHINCHILLA (*Chinchilla laniger*) (Family *Chinchillidae*). Chinchillas have moderately long, thick tails, with short hairs below and long hairs above, forming a kind of brush.



[Photos]

[W. S. Berridge.

VISCACHA (*Viscacia viscacia*).

This gregarious rodent lives in warrens called "Viscacheras," which are often adopted by birds, a Little Owl being the commonest lodger.

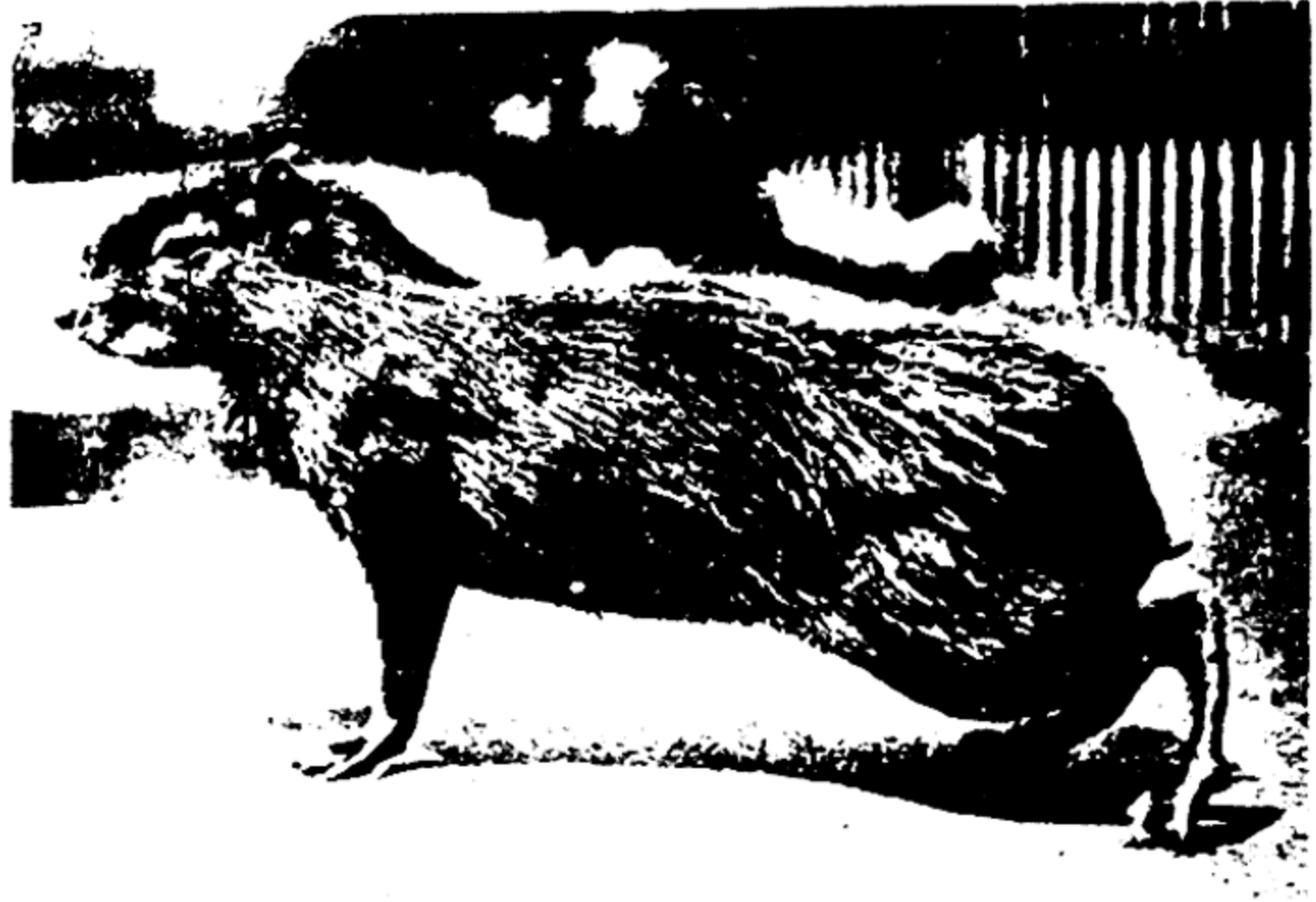
inches long and the tail about five. It is gregarious, lives in burrows and crevices in the Andes of Chile and Bolivia, and is extraordinarily active, racing over the rocks with amazing speed and precision. It was formerly very abundant, but is now comparatively scarce from persistent persecution by fur traders.

Cuvier's Chinchilla (*Lagidium peruanum*) resembles the last in habits but is as large as a rabbit. It inhabits the Andes up to 15,000 feet. Its fur is not so valuable.

The Viscacha (*Viscacia viscacia*), inhabiting the pampas of the Argentine, is a big-

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headed, heavily - built rodent, the head and body measuring nearly two feet and the tail about seven inches. The third digit of the hind foot has a thick brush of stiff bristles used as a fur-cleaner. The general colour is mottled grey and black, but the face is banded black and white. This animal is mostly nocturnal and gregarious, living in warrens called "viscachas," which are often

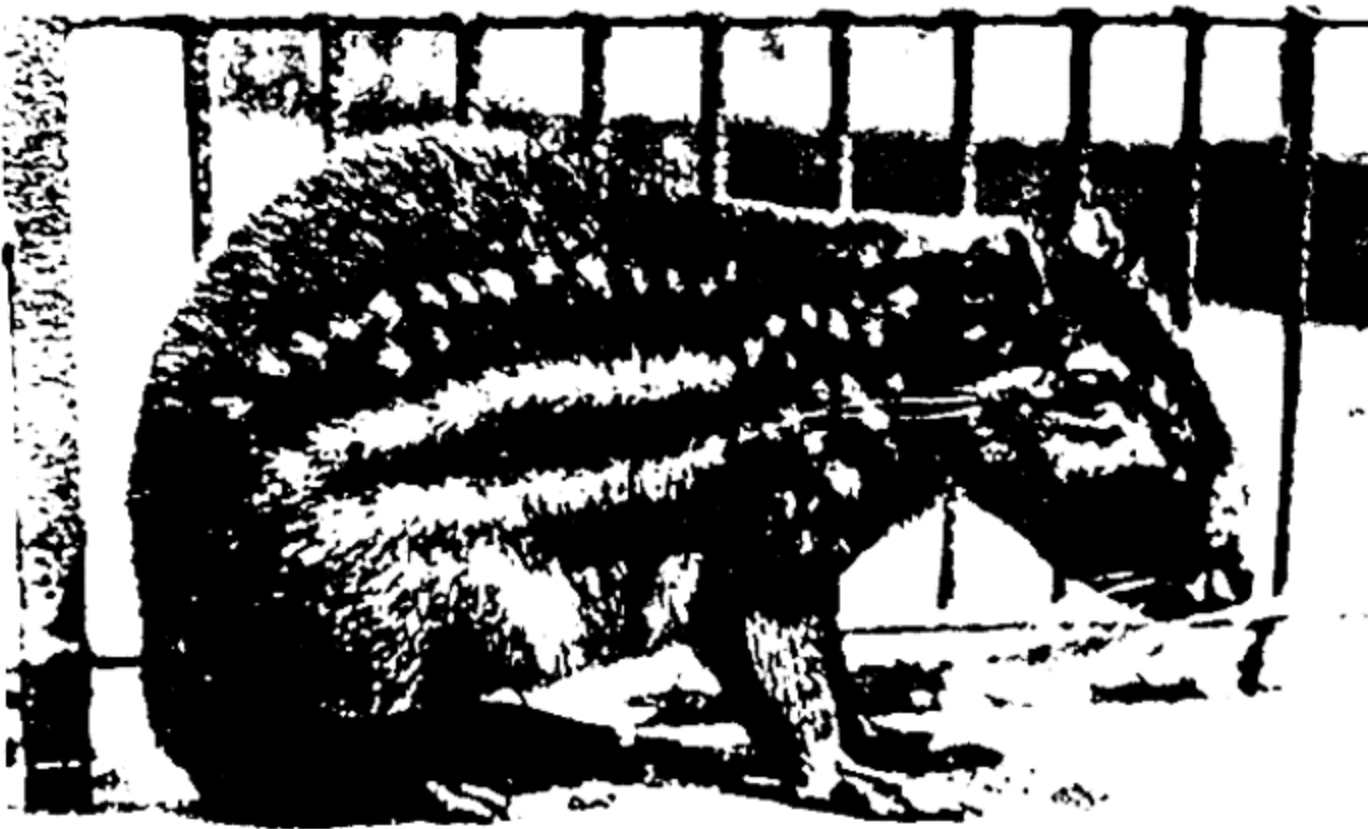


WEST INDIAN AGUTI (*Dasyprocta cristata*).
Agutis are mainly nocturnal, lying up by day in burrows under tree roots or other sheltered spots.

adopted by birds, a little owl being the commonest lodger. Viscachas have a curious habit of piling up near their burrows heaps of food-rubbish, stones, cattle-bones or other objects they find on the pampas.

Agutis, Paca, Cavies and Capybara. The rodents grouped under these headings differ from the Chinchillas in having the tail short or absent. Each type represents a special family.

Agutis (Family *Dasyproctidae*). These are about as large as rabbits, measuring some one and a half feet long, but stand high on their slender legs. Their technical name is derived from the long, rather bristly hair on the hindquarters. They are swift-footed forest dwellers and mainly nocturnal, lying up by day in burrows under tree roots or other sheltered



[Photos] [W. S. Berridge.
SOOTY PACA OR SPOTTED CAVY (*Cuniculus paca*).
This is found in the forested districts of all the northern countries of South America.

spots. Only one or two young are born at a time. They have a wide range and there are many different sorts, such as the Red-rumped Aguti (*Dasyprocta aguti*) from Brazil, the Mexican (*D. mexicana*) from Central America, the West Indian (*D. cristata*); and others, differing principally in colour, which varies from speckled red to speckled black.

CAVIES (FAMILY CAVIIDAE)



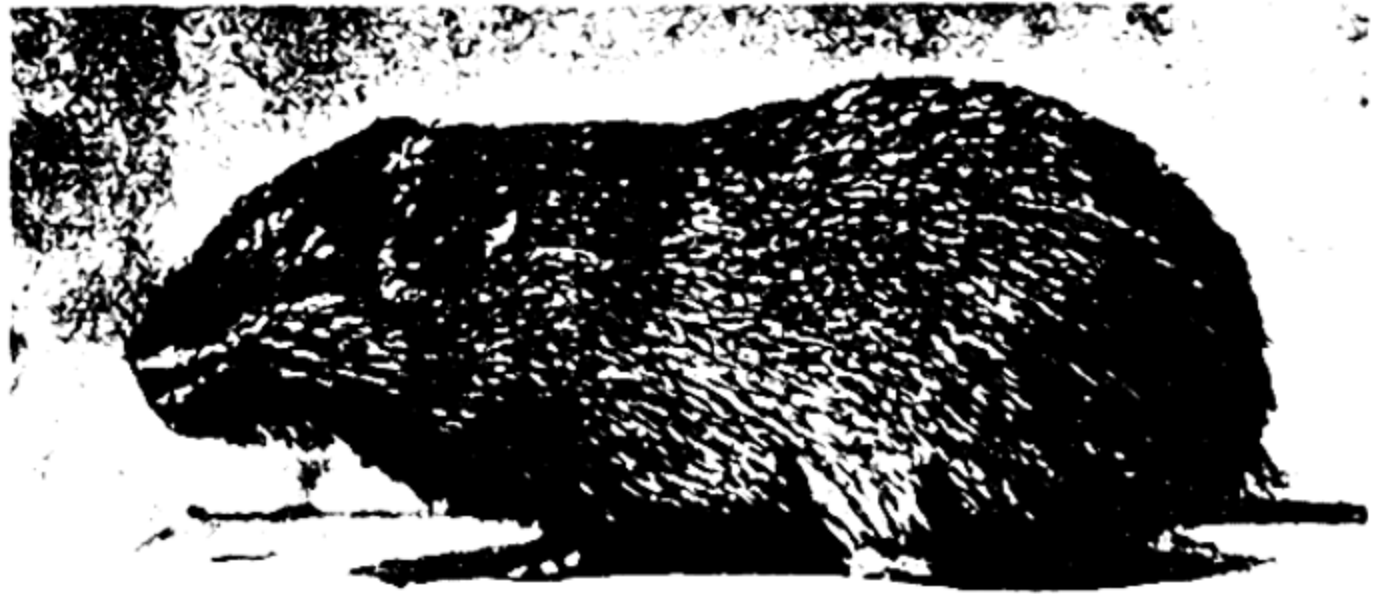
[F. W. Bond.]

GUINEA-PIG OR RESTLESS CAVY.

This animal was introduced into Europe from Dutch Guiana in the sixteenth century.

dark brown coat. It is found in the forested districts of all the northern countries of South America.

The size and general appearance of the typical Cavies (Family *Caviidae*) are familiar from the tame variety known as the Guinea-pig, a name which is no doubt a corruption of Guiana-



[W. S. Berridge.]

PAMPAS CAVY.



[W. S. Berridge.]

PACA RANA OR FALSE PACA (*Dinomys branickii*).

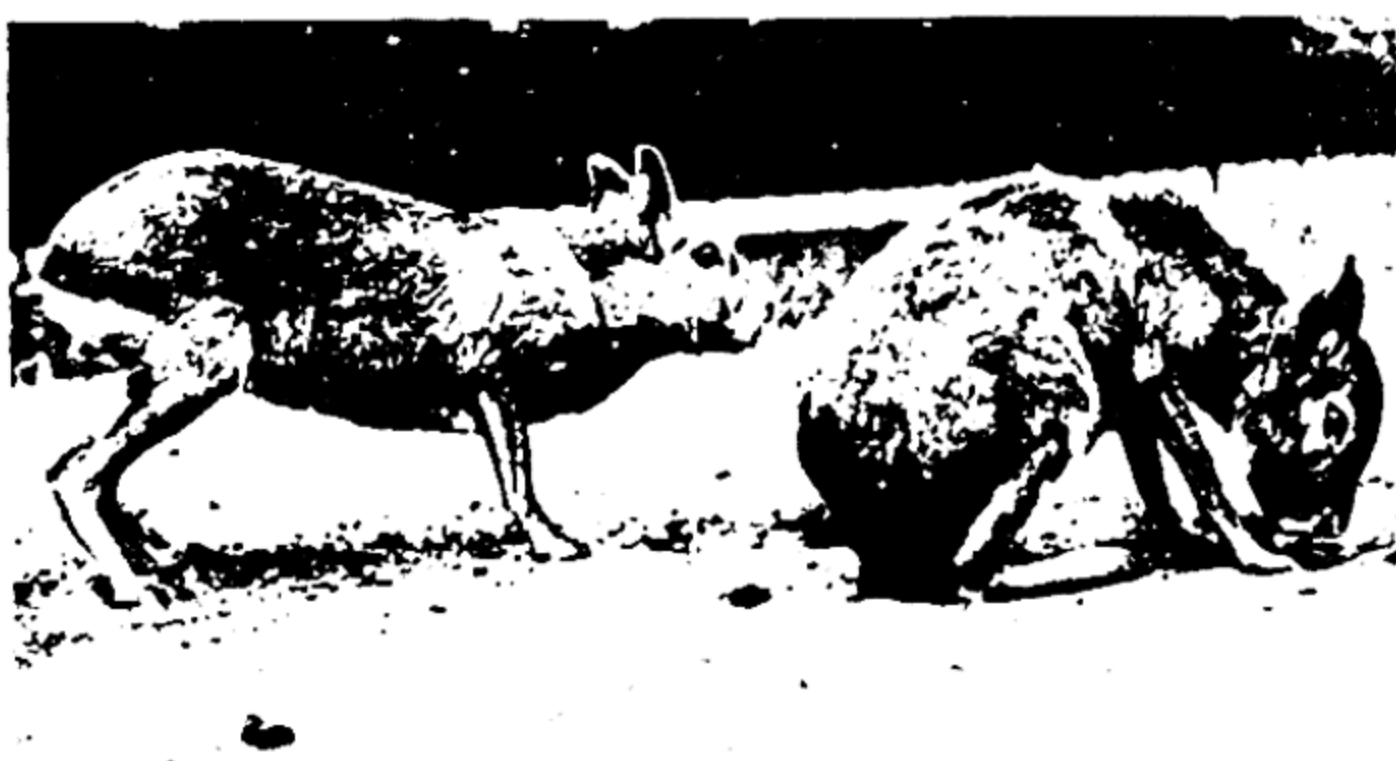
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Cavies. The Sooty Paca or Spotted Cavy (*Cuniculus paca*). This represents the Family *Cuniculidae*, and measures about two feet long and in habits and appearance resembles a large heavily-built Aguti, with a head shaped like a cart-horse's; and it may be further distinguished by its pattern of white spots and longitudinal stripes on an otherwise

pig. The wild species, of which there are many distributed over the greater part of South America, are very like the smooth-haired domesticated variety, except that they are never parti-coloured but of a tolerably uniform grizzled olive or brown hue. The animal was introduced into Europe from Dutch Guiana in the sixteenth century, the

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PATAGONIAN CAVIES (*Dolichotis magellanica*).
This cavy stands about one foot in height and measures three feet in length.

wild species probably being Cutler's Cavy (*Cavia cutleri*), known to have been domesticated by the Incas of Peru.

The Patagonian Cavy or Mara (*Dolichotis magellanica*), sometimes known locally in the Argentine as the "hare," is a very different-looking

animal, standing about one foot high and measuring three feet long. It has long legs, longish ears and is greyish or yellowish in colour, with a conspicuous white patch on the rump. It lives, usually in parties of a dozen or so, in the pampas of the Argentine and the stony wastes of Patagonia, and is diurnal, feeding and basking in the sun by day and sheltering in burrows by night. It is remarkably swift and trusts to its speed to escape the pursuit of wild dogs and other enemies.

The Carpincho or Capybara (*Hydrochoerus hydrochoeris*), the sole representative of this family, the *Hydrochoeridae*, is the largest of the rodents, being comparable in size to a pig, which it further resembles in its scanty clothing of coarse hair. The colour is yellowish-brown, the length about four feet, and the weight up to one hundred pounds. Its feet are very like those of the tapir, and it is very similar to those animals in habits, living in the forests and lowlands of Brazil and adjoining countries, always near water, into which, being an expert diver and swimmer, it plunges when alarmed. Its chief enemies on land are the jaguar and the puma and in the water the anaconda and cayman. The food consists of grass and other vegetable matter and water-weeds.



Photos]

CAPYBARA OR CARPINCHO (*Hydrochoerus hydrochoeris*).
This rodent always lives near water, being an expert diver and swimmer.

[W. S. Berridge.

Order CARNIVORA (Flesh-eating Mammals)

This order contains such familiar mammals as cats, dogs, bears, seals and others. The digits, five, rarely four, in number, are armed with claws. The general organization of the brain and other parts is of a high type. The front teeth are stable in number and arrangement, consisting usually above and below of six incisors set in a lightly-curved or straight line between two tusk-like canines, with the outer incisor larger than the inner; two of the cheek-teeth, the fourth or last premolar above and the first molar below, which work against one another, very commonly have their main cusps high, blade-like, and adapted for cutting flesh; hence they are called the sectorial or carnassial teeth. But many members of the order, showing the inappropriateness of its name, are mainly herbivorous; and in these the sectorial teeth lose their characters.

By the structure of their feet, it is customary to divide the carnivora into two suborders, the *Fissipedia*, or cleft-footed species, like Cats, Dogs, Bears, etc., and the *Pinnipedia*, or fin-footed species, comprising the Seals and Walruses, in which the limbs are converted into paddles.

CLASSIFICATION OF THE ORDER CARNIVORA

Suborder FISSIPEDIA (Normal-footed)

Tribe Aeluroidea (Cat-like)

Family *Hyaenidae* (Hyaenas)

„ *Cryptoproctidae* (Fossa)

„ *Herpestidae* (Mongooses)

„ *Viverridae* (Civets, Genets, etc.)

„ *Felidae* (Cats, Lions, Tigers, Lynx, Cheetah, etc.)

Tribe Arctoidea (Bear-like)

Family *Canidae* (Dogs, Wolves, Jackals and Foxes)

„ *Mustelidae* (Weasels, Martens, Skunks, Badgers and Otters)

„ *Procyonidae* (Raccoons, Coatis, Cacomistles, Kinkajous, etc.)

„ *Aeluridae* (Pandas)

„ *Ursidae* (Bears)

Suborder PINNIPEDIA (Fin-footed)

Family *Otariidae* (Sea-lions)

„ *Odoboenidae* (Walruses)

„ *Phocidae* (Seals).

Suborder FISSIPEDIA

The term cleft-footed means that the digits, whether webbed or not, can be spread and separated from each other during locomotion, whether

MAMMALIA (ORDER CARNIVORA)

it be for running or swimming. Also in this group the cheek-teeth, with rare exceptions, are not all alike, but varied in shape and function.

This suborder is itself divided into two main groups, the *Aeluroides* or cat-like, and the *Arctoidea* or bear-like, which unfortunately cannot be distinguished by any external feature, although they differ, in some anatomical respects, particularly in the bones of the skull connected with

hearing and smelling.

Aeluroid Carnivores or Cats and their Allies

In this group the nasal passages in the skull are almost filled by two scrolls of spongy bone which arise from the back of the passages and reach nearly to the nostrils; and on the lower side of the skull, beneath the ear, there is a hollow, bony swelling, called the *bulla*, which in this group consists of two bones, an outer and an inner, joined together, and from the line where they meet arises a bony



[Major A. Radclyffe Dugmore.

SPOTTED HYAENA (*Crocuta crocuta*).

This is distinguished from the other species by its larger size, more rounded ears, shorter, softer coat, and by its pattern of dark spots on a yellowish-tawny ground.

shelf dividing the cavity of the bulla into two chambers.

These characters are common to the Hyenas (Family *Hyaenidae*), the Mongooses (Family *Herpestidae*), the Fossa (Family *Cryptoproctidae*), the Civet Cats (Family *Viverridae*) and the Cats (Family *Felidae*).

It is noteworthy that, with the exception of the Cats, none of these families is represented in America.

TRIBE AELUROIDEA (CAT-LIKE)

Hyaenas (Family *Hyaenidae*)

Although from their appearance Hyaenas are popularly regarded as akin to the dogs, they belong in reality to the cat tribe and resemble the mongooses and the fossa in having a large, saccular scent-pouch beneath the root of the tail. They are especially distinguished by their long, digitigrade, dog-like legs and feet, which have only four toes, and by their powerful jaws and massive teeth adapted for cracking thick bones, big pieces of which they are capable of swallowing and digesting. Their general shape is ungainly owing to their long neck and legs, short body and weak, sloping hindquarters. They are, indeed, not built for leaping or speedy running. At most, they achieve a shambling gallop, seldom employed for chasing living prey. Their food consists very largely of the dead bodies of big game, and they share with vultures and jackals the distinction of being the chief scavengers of Africa and southern Asia. Nothing, however, comes amiss to them in the way of animal food, carrion or otherwise; and they will eat any small creatures they can kill, even children at times, and are often a pest to farmers by taking sheep, goats, small house-dogs and other livestock.



[W. S. Berridge.

STRIPED HYAENA (*Hyaena hyaena*).

This hyaena is smaller and more lightly built than the Spotted Hyaena.

There are two well-marked types represented by the Striped and Spotted Hyaenas.

The Striped Hyaena (*Hyaena hyaena*) has a long, shaggy, greyish coat, relieved by black stripes. It is a smaller, more lightly-built animal than the Spotted, standing a little over two feet at the shoulder; and further differs in the shape of its teeth and in the young resembling the mother in colour at birth. It is found in India, south-western Asia and over a large part of North Africa, generally frequenting open, dry country, lying up by day in burrows or caves on the hill-sides and coming out at night to search for food, which it finds by scent, discovering by this means the freshly-interred human bodies. Notoriously a cowardly, skulking beast, it seldom bites when attacked, the instinct of self-defence in an animal with such powerful jaws being strangely suppressed.

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In Africa south of the Zambesi, this species is represented by the Brown Hyaena (*H. brunnea*), or Strand Wolf, a larger species, blackish-grey in colour and striped on the legs only. Its habits, however, seem to be identical, but on the coast of south-western Africa it is said to haunt the beach to feed on crabs, fish or even whales that may be washed ashore.

The Spotted Hyaena (*Crocuta crocuta*) may be distinguished at a glance from the other species by its larger size, more rounded ears, shorter, softer coat, and by its pattern of dark spots on a yellowish-tawny ground colour, the legs being usually brown, particularly in immature individuals. The cubs are entirely brown all over and gradually acquire more and more of the tawny-yellow tint the older they get. The height of the adult is about

two and a half feet. This Hyaena is found only in Africa south of the Sahara, although not in the Congo forest. Its habits closely resemble those of the other species, but it is less solitary and more venturesome, boldly invading the camps of travellers and the huts or villages of natives at night in search of food, clearing away the refuse it finds and carrying off any live-stock it can kill, sometimes even attacking sleeping human beings.



[W. S. Berridge.

AARD WOLF (*Proteles cristatus*).

This animal is seldom seen, because it lies up in burrows during the day and ventures out to feed only at night.

On this account it is very much feared, and exaggerated accounts of its depredations, appearance and size, promulgated by natives, have given rise to the belief of the existence in East Africa of a strange unknown mammal known to English settlers as the "Nandi Bear."

Aard Wolf, or Maned Jackal (*Proteles cristatus*). This must be regarded as a degenerate representative of the Hyaena stock, adapted to a different diet. In appearance it is very like a half-grown Striped Hyaena; but it differs from all the Hyaenas in having the "dew-claw" on its fore feet, which the Hyaenas have lost, and more particularly in its comparatively weak jaws and diminutive, widely-spaced cheek-teeth, quite unfitted for the mastication of ordinary flesh. It feeds, indeed, upon soft carrion to a certain extent, but mainly upon white-ants. It is restricted to Africa, where it ranges from Somaliland to the Cape Province. It is,

MONGOOSES (FAMILY HERPESTIDAE)



MARSH MONGOOSE.

[F. W. Bond.]

they have a scent-gland beneath the root of the tail. They are typically long-bodied, short-legged, long and bushy-tailed animals rather small in size covered with coarse, usually grizzled hair, the head being broad, with a pointed muzzle and short rounded ears. In habits they



INDIAN OR GREY MONGOOSE (*Herpestes nyula*).
This little animal is capable of killing most carnivores of its own size, or even larger.

[W. S. Berridge.]



KUSIMANSE (*Crossarchus obscurus*). [W. S. Berridge.]

however, seldom seen, because it lies up in burrows during the day and ventures out to feed only at night.

Mongoose

(Family *Herpestidae*)

In having six cheek-teeth above and below on each side, the Mongooses resemble the Civets and Genets. Their claws are long, non-retractile, and used for digging, and

are terrestrial, living in burrows or natural holes and are for the most part active, predatory little creatures, feeding on small mammals, birds, eggs, reptiles, frogs, crabs, insects or even fruits, partiality for this or that kind of food depending on the species. The family is very widely distributed almost all over Africa.

MAMMALIA (ORDER CARNIVORA)

one species being found in Spain, and over southern Asia from Persia to the Malay Islands. It is in Africa that the greatest diversity in the structure and habits of Mongooses occurs, all the Asiatic kinds being tolerably similar. About thirty species are known, only a few of which can be mentioned here.

Of these the best known is the Common Indian Mongoose (*Herpestes nyula*), which is widely distributed in the country and varies locally in colour from grey to reddish grey, the head and body measuring about one and a half feet, the tail being a little less. Although easily tamed and turned into a household pet, this Mongoose is naturally a savage, courageous, sanguinary little beast, capable of killing most carnivores of its own size, or even larger. It lives solitary or in pairs in thickets, fields, hedgerows, seldom in thick jungle, and lies up and breeds in burrows. It preys upon rats, mice, birds, frogs, indeed, upon any animals it can find and is famous

for its hostility to snakes, fearlessly attacking even the most venomous kinds. Many stories have been told of its combats with the deadly cobra. At one time it was supposed to be immune to the venom of this snake; but experiments have shown that this is not so. The Mongoose, indeed,



[W. S. Berridge.

FOSSA (*Cryptoprocta ferox*).

When attacked, the Fossa is said to emit a skunk-like odour from its scent glands.

takes the greatest care not to be bitten, avoiding the strokes of the snake by active side-leaps and watching for the chance, when the reptile has missed, to spring upon it and, if possible, grip it by the neck, close to the head. Failing in this, it bites the back and leaps clear before the snake can recover. Thus the contest is continued, until the cobra, baffled and exhausted by the activity of its opponent, offers the chance for a quick pounce and firm grip behind the head, either by attempting to escape or by delaying too long to recover its defensive attitude. Almost equally famous is this Mongoose for clearing ships and houses of rats; and many years ago it was introduced into the West Indies to keep down these rodent pests, which destroyed the sugar-canes.

Some of the African Mongooses differ in no respects in habits from the Indian species. But others are less predacious, less active, and prey to a greater extent upon insects, and are gregarious, living in companies, in burrows or old termite mounds, and sometimes combining to attack their prey. Well-known examples are the Banded Mongoose (*Mungos mungo*),

MONGOOSE—FOSSA

distinguishable by its black stripes, and the Meerkat (*Suricata suricatta*), a small, fawn-coloured, sharp-nosed little animal, not much larger than a big rat. These gregarious species have the habit of squatting upon their haunches outside their burrows, watching for enemies and ready to dart underground at a warning cry from one of the sentries. The Egyptian Mongoose is one of the largest species, and is interesting from its food consisting largely of the eggs and young of the crocodile.



LARGE INDIAN CIVET (*Viverra zibetha*).
This species has feet like a cat's, with protected, retractile claws. It ranges from Northern India to China and Malaya.

Fossa. In Madagascar, a home of primitive mammals, there are a few mongoose-like and civet-like species which serve in a measure to link those two families together. The largest and most interesting of these is the Fossa (*Cryptoprocta ferox*), the sole representative of the family *Cryptoproctidae*. This animal combines the scent gland of the Mongooses with the feet of the Palm Civets and the teeth of the Cats. But the likeness to the Cats in the teeth has been independently acquired in relation to highly predacious habits and carnivorous diet.



[Photos]

AFRICAN CIVET (*Civettictis civetta*).
In this species the claws are unguarded.

[W. S. Berridge.]

The Fossa is uniformly brown in colour, its head and body measuring a little over two feet and its tail about one and a quarter feet. In habits it is nocturnal and mainly arboreal and when attacked is said to emit a skunk-like odour from its scent glands. The natives of Madagascar, indeed, report that when prowling around their fowl-pens at night, it suffocates the poultry with the odour.

MAMMALIA (ORDER CARNIVORA)



[W. S. Berridge.
CHINESE MASKED PALM CIVET (*Paguma larvata*).
The Palm Civets are less predatory than the genets and more frugivorous in diet.

Civets, Genets and Palm Civets

(Family *Viverridae*)

This family differs from the Cats in having the head longer, lower and altogether more dog-like, the cheek-teeth less specialized for cutting and less reduced in number, there being typically six cheek-teeth above and below on each side; there is also a perfume gland in the groin. The

feet, although never quite so markedly digitigrade as in the Cats, always have the claws sharp and retractile and sometimes protected by lobes of skin as in those animals; but the first toe (hallux) of the hind foot is never absent. None of its members is so predatory in habits or so carnivorous in diet as the Cats, many of them subsisting to a great extent on fruits and other vegetable food. The perfume glands appear to be used for scenting the ground, tree-trunks and other objects to enable the members of the species to find each other in the forest.

Civets or Civet Cats. Of these the Large Indian Civet (*Viverra zibetha*) and the African Civet (*Civettictis civetta*) are the largest and best known. They are nocturnal, terrestrial animals, about the size of a large fox-terrier, and feed upon small mammals and birds and fruits of various kinds. In both the perfume glands are well developed. The Indian species has feet like a cat's, with protected, retractile claws; the general colour of the body is greyish, but the black tail is banded with white, the throat is black and white, and there is a black crest down the back; the fur is soft and thick, making the skin of some



[F. W. Bond.
DONGOLAN GENET (*Genetta dongolana*).
The genets are related to the civets, but are much smaller, with longer tails and shorter legs, being almost exclusively arboreal.

CIVETS—GENETS

importance in the fur-trade for wraps. The head and body measure two and a half feet, and the tail is one and a half feet long. The species ranges from Northern India to China and Malaya.

There are several smaller, related species in the East. Apart from their furs, these Civets are of some commercial value on account of the use of the secretion of their glands as a basis for perfumes. It smells, when diluted, like the cobbler's substance known as "heel-ball." In some parts of the East the animals are kept in cages and the perfume extracted periodically with a small spoon. The Little Indian Civet (*Viverricula indica*) has even been introduced into Socotra and Madagascar for the sake of its scent.

The African species, found almost all over Africa south of the Sahara, is about the size of the Large Indian Civet, but differs in having its claws unguarded, also in its coarse fur and heavily-spotted body.

Genets (*Genetta*). These are related to the Civets, but are much smaller, with longer tails and shorter legs and are almost exclusively arboreal in habits and extremely active. The colour is generally grey or yellowish-brown, relieved by many small spots or fewer large blotches. Apart from



(W. S. Berridge.

INDIAN PALM CIVET OR TODDY CAT
(*Paradoxurus hermaphroditus*).

Its popular name is derived from its supposed fondness for "toddy" or "palm-juice."

one species, the Common Genet (*G. genetta*), which still survives in Spain and the south of France, these animals are confined to Africa, where there are many different kinds, the Blotched and Feline Genets (*G. tigrina* and *G. felina*), of South Africa, and the Pardine Genet (*G. pardina*), of West Africa, being the best known. They vary little in size, the Spanish species measuring: head and body, one foot ten inches and the tail about one foot six inches.

An interesting variation of the Genet type may be briefly referred to as a recent discovery in the heart of Africa. This is the Water Genet (*Osbornictis piscivora*), which is the size of a large Genet, but differs in having sharper teeth, fitted for holding slippery fishes, naked feet for walking on the muddy banks of streams, and in having lost all trace of the pattern, the general colour being reddish-brown relieved by white patches on the head, and a black tail. It is found on the banks of streams in the Belgian Congo.

MAMMALIA (ORDER CARNIVORA)

Palm Civets. These animals, with their long tails, short legs and arboreal habits, superficially resemble Genets, but are more plantigrade in gait, much less active, less predatory in habits and more frugivorous in diet, the cheek-teeth in consequence having broader, more crushing crowns. There are many species, ranging in Asia from India to South China and Celebes, the most familiar being the Toddy Cat (*Paradoxurus hermaphroditus*), its popular name being derived from its supposed fondness for "toddy," or "palm-juice." It has longish, coarse fur, blackish-grey in colour and sometimes spotted and lined with black, the head and body measuring about two feet and the tail one and a half feet. In habits it is nocturnal, sleeping in trees during the day and feeding by night on small animals, eggs, insects, fruit and vegetables. But it often adopts human abodes and lies up in roofs, outhouses and old drains, and may be very destructive to the householders' poultry. It is found in Ceylon, India and Malaya.

Binturong. The curious animal known as the Binturong (*Arctictis binturong*) resembles a large, shaggy Palm Civet with a much shorter muzzle and tufted ears; but its chief peculiarity lies in the long, powerful tail being as prehensile as in some of the American Monkeys. The colour is wholly black or grizzled-black, the head and body measure about two and a half feet and the tail is over two feet long. It is nocturnal and arboreal, living exclusively in the forest, but although its diet is apparently the same as that of the Palm Civets, its teeth are much smaller and flatter-crowned. As in the case of the Palm Civets, the perfume glands of the Binturong give off a strong odour resembling that of an uncleaned cage of tame mice. The Binturong ranges from Assam to the Philippines.

Otter Civet. A still more remarkable relative of the Palm Civets is the Otter Civet (*Cynogale bennetti*), which, in its brown colour and particularly the shape of the head, as well as in its aquatic habits, resembles a small otter. Its teeth have sharp cusps for holding slippery fishes, its nostrils open on the summit of the muzzle so that the animal can breathe at the surface with its whole body submerged, and the tactile bristles on the muzzle are long and stiff, as in most aquatic mammals. But the tail is comparatively short and the feet unmodified. The animal is evidently not a fast swimmer, and it is known to be a tolerably expert climber. It ranges from Malaya to Borneo.

In the forests of Central Africa there is an animal called the Two-spotted Palm Civet (*Nandinia binotata*), which is very commonly imported to Europe for zoological gardens. In habits, appearance and size it resembles the typical Palm Civets represented by the Toddy Cat, although it has close, thick fur, spotted with black and, on the shoulders, two pale spots, whence its popular name is derived. But some points connected with the skull show that it is a very primitive type, the most primitive of all the existing cat-like carnivores.



From the Film)

["Africa Speaks."]

EAST AFRICAN LIONS (*Panthera leo*) AND THEIR KILL.

Lions hunt for food by day as well as by night, preying principally upon antelopes of various kinds, wild pigs, buffaloes, zebras and farm-stock.

CAT FAMILY (Felidae)

This family is the most highly organized and the most completely adapted for predatory life of all the Carnivora. Its members are digitigrade, the first digit of the forefoot being small and raised high off the ground, that of the hind foot absent; the claws are retractile and, except in the Cheetah, sharp, curved and protected by lobes of skin on the toes. The jaws are short and massive and the cheek teeth are reduced in number to four, or even three, of which two only are functional, above, and three below; their crowns, especially those of the sectorial teeth, form cutting blades, not crushing surfaces.

Cats are distributed all over the great continents of the world from north temperate regions southwards; but do not extend beyond Borneo in Asia and are absent from Madagascar and Australia. Their habits are very similar wherever they are found. For preference, as a rule, they kill their own prey, which consists mainly of any mammals or birds they can overcome, but many of them will eat reptiles, frogs, fish or even insects and carrion at times. As a rule, they catch their prey by stealthily stalking or by lying in wait for it until within springing distance; but, owing to the shortness of the jaws, they never secure it with a quick snap, but strike it down or grab it with their paws before seizing it with the mouth.

There are a great many different kinds of Cats, but apart from the common house cat, the best known are the lions, tigers, panthers or leopards and their allies. These species constitute a group, or genus, by

MAMMALIA (ORDER CARNIVORA)

themselves, known as *Panthera*, which is distinguished by having the upper end of the windpipe, containing the vocal organs, suspended from the skull by a chain of bones and elastic ligaments so that it can be raised and lowered at will. These great cats roar but never purr. In all the other cats the vocal organs are attached tolerably closely to the skull by a short series of bones. The voice of these cats, although often loud, is never describable as a roar, and pleasure is expressed by purring.

Lion (*Panthera leo*). The Lion is distinguished from the other species of this group by its uniform tawny hue, the presence of a black tuft on the tip of the tail in both sexes and by the usual development of a mane in the male. Both in the loss of the pattern and in the presence of the mane, the Lion is also the most specialized member of the Cat family; and on those grounds alone might deserve the title "King of Beasts"; but the Lions which earned that distinction, deserved it on account of the magnificence of their appearance due to a huge black and tawny mane covering the neck and shoulders, long enough almost to sweep the ground, and passing along the belly as a deep black fringe. But such Lions are no longer known as wild animals. They inhabited Barbary and the Cape, and are believed to be extinct.

Mane. In no existing wild Lions, either in Asia or Africa, does the mane grow over the shoulders or along the belly. It may be full on the neck and largely black; and Lions so adorned are admittedly handsome beasts. But often it amounts to little more than a longer or shorter frill and may be entirely absent, as it is in the Lioness. It is doubtful whether Lions of this description would ever have been regarded as regal or selected as our national emblem. The Lion's mane, indeed, is more variable individually than the human beard, since it may be black or tawny, absent, small or full in the same district. Another peculiarity is its tendency to be fostered in growth by conditions of captivity, Lions in menageries having finer manes than those in the wilds. The reason for this is unknown. The use of the mane is also unknown; but its development on the neck, and sometimes along the belly, suggests that it may safeguard vulnerable parts from the teeth and claws of rivals in their combats for the possession of Lionesses.

Tail-spur. The so-called Spur at the end of a Lion's tail is so often referred to that it calls for passing notice. An imaginative naturalist once suggested, indeed, that the beast uses it to lash his flanks and stimulate his fury. This spur, when present, is nothing but a naked horny piece of dead skin at the extreme tip of the tail and is so enveloped in the tuft that it cannot possibly be brought into contact with the animal's body.

Roar. Most of the Cats are silent animals, except during the breeding season, when they use their voices as a sexual call; but the Lion is notoriously noisy, roaring, often in concert, but for what purpose is unknown,

THE CAT FAMILY (FELIDAE)

at all seasons of the year, especially after sunset and at night. The roar of the Lioness is similar but not so resonant. In menageries when one Lion starts to roar, the rest take it up and the volume of sound is deafening. But the popular idea that the roaring is stimulated by hunger is a mistake. In the London Zoological Gardens, for instance, although the Lions may roar at any time of the day, they almost always do so as soon as the house is shut after they have been fed.

Distribution. Within historic times Lions were found in Greece, Asia Minor and Syria ; but they have long ceased to exist in those countries. They survived until comparatively recently in Mesopotamia and Persia ;



[Major A. Rudclyffe Dugmore.]

EAST AFRICAN LION (*Panthera leo*).

The mane is very variable individually, being black or tawny, absent, small or full in the same district.

but it is doubtful whether any now remain there. In North India they formerly extended from Sind to Bengal ; but between 1814 and 1880 they were exterminated except in Gujerat, where a few still survive, under strict protection, in the Gir forest. There is no doubt that man was the exterminating factor in Asia, as he also was in the case of the Barbary and Cape Colony Lions above referred to. At the present time Lions, although in rapid process of extinction in all the settled districts, are generally distributed throughout Africa south of the Sahara, apart from the Congo forest, and are still plentiful in many districts where Big Game is abundant. But their predatory habits make them impossible neighbours to white men, and their range is being steadily curtailed as the occupation of the continent proceeds.

MAMMALIA (ORDER CARNIVORA)

Habits. Lions hunt for food by day as well as by night, preying principally upon antelopes of various kinds, wild pigs, buffaloes, zebras and goats and cattle near the settlements. But they devour any carcase they come across, and even in places teeming with live game will return time after time to feast on a dead rhinoceros in the last stages of decomposition. They are usually shy of man; but sometimes attack him unprovoked, and there are well-established cases of them becoming habitual man-eaters. Such Lions are sometimes, but by no means always, old animals which find men easier to catch than wild game.

Lions are not so solitary in their habits as other cats, parties ranging from half-a-dozen to a dozen being more commonly met with than a single individual or pairs. Sometimes, also, they combine in the killing of prey. There is, for instance, a well-known account of three full-grown Lions attacking a wounded bull buffalo, which would have been more than a match for them singly.

Lions are said to be monogamous, although the evidence is not conclusive. Nevertheless, the male hunts for the female while suckling her cubs; and the cubs, when old enough, accompany their parents in quest of game. The period of gestation is from four to five months, the birth of the cubs, usually from two to five to the litter, taking place either before the eyes are open or after. Unlike their parents, the cubs generally show a distinct pattern of rosette-like spots, which on the back tend to run into looped stripes. This pattern, no doubt that of the Lion's ancestor, attests the close kinship between this animal and the tiger, leopard and jaguar. At two years, a Lion is sufficiently well grown to be able to pull down a zebra, but full development is not reached before four or five years. He may live to be about twenty years, but by that time his teeth are worn, his activity and strength have left him and his usual fate is to be torn to pieces by hyaenas and jackals. A full-grown Lion stands about three feet at the shoulder, and measures ten feet in total length, of which the tail is three feet, and he may reach a weight of five hundred pounds. The Lioness is always smaller, the weight being from two hundred and fifty to three hundred pounds.

Tiger (*Panthera tigris*). Although at once distinguishable from the lion by his bright yellowish-orange colour, vertical, black, generally looped stripes, white underside, white patches over the eyes, and in the absence of a conspicuous mane, the Tiger resembles him closely in average size, strength and other particulars, but the hindquarters are not so well developed and the head is not so flat. The voice of the two animals is so much alike as often to deceive inexperienced ears; but the roar of the Tiger, a sexual call, is a single deep intonation, probably repeated after an interval of half a minute or so; the repetitions, however, are never in rapid succession, nor do Tigers roar in concert like lions. But a Tiger starting to call in the Zoological Gardens will often set the lions roaring.



Photo]

[F. W. Champion, Indian Forest Service, author of "With a Camera in Tigerland"
TIGER (*Panthera tigris*).

Tigers habitually frequent forest and thick jungle, with which their colour harmonizes, not open bush, like lions

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MAMMALIA (ORDER CARNIVORA)

Tigers are found only in Asia, where they occur as far to the north as Mongolia. Thence they spread in a south-westerly direction as far as the Caucasus and southwards as far as Java and southern India. They came originally from the north and migrated southwards, entering India by way of China and Burma; but they reached southern India after the isolation of Ceylon and are unknown on that island.



SIBERIAN TIGER.

This local race is typically paler in hue than the Indian, and grows a thick coat in winter.

They vary much more in colour and size than lions. Indian specimens are about the same size as lions; but Mongolian specimens are usually larger, standing thirty-eight inches at the shoulder, whereas Sumatran Tigers are much smaller, less than thirty inches. Mongolian Tigers are typically paler in hue and grow a thick coat in winter; Caucasian Tigers are also thick coated at that season, but their stripes are often brown and rather indistinct; the most fully-striped and darkest-tinted specimens come from Sumatra and Java. Black and white lions are unknown; but both these varieties occur as "sports" in Tigers, although black is uncommon. In white Tigers the stripes may retain their dark tint; but

sometimes they are obliterated, as in albino tame cats.

Tigers habitually frequent forest and thick jungle, with which their colour harmonizes, not open bush, like lions; and in the tropics they lie up during the heat of the day, and prowl about after sunset, often travelling long distances in search of prey, which consists mainly of deer, wild



Photos.]

INDIAN TIGER (*Panthera tigris*).

[W. S. Berridge.

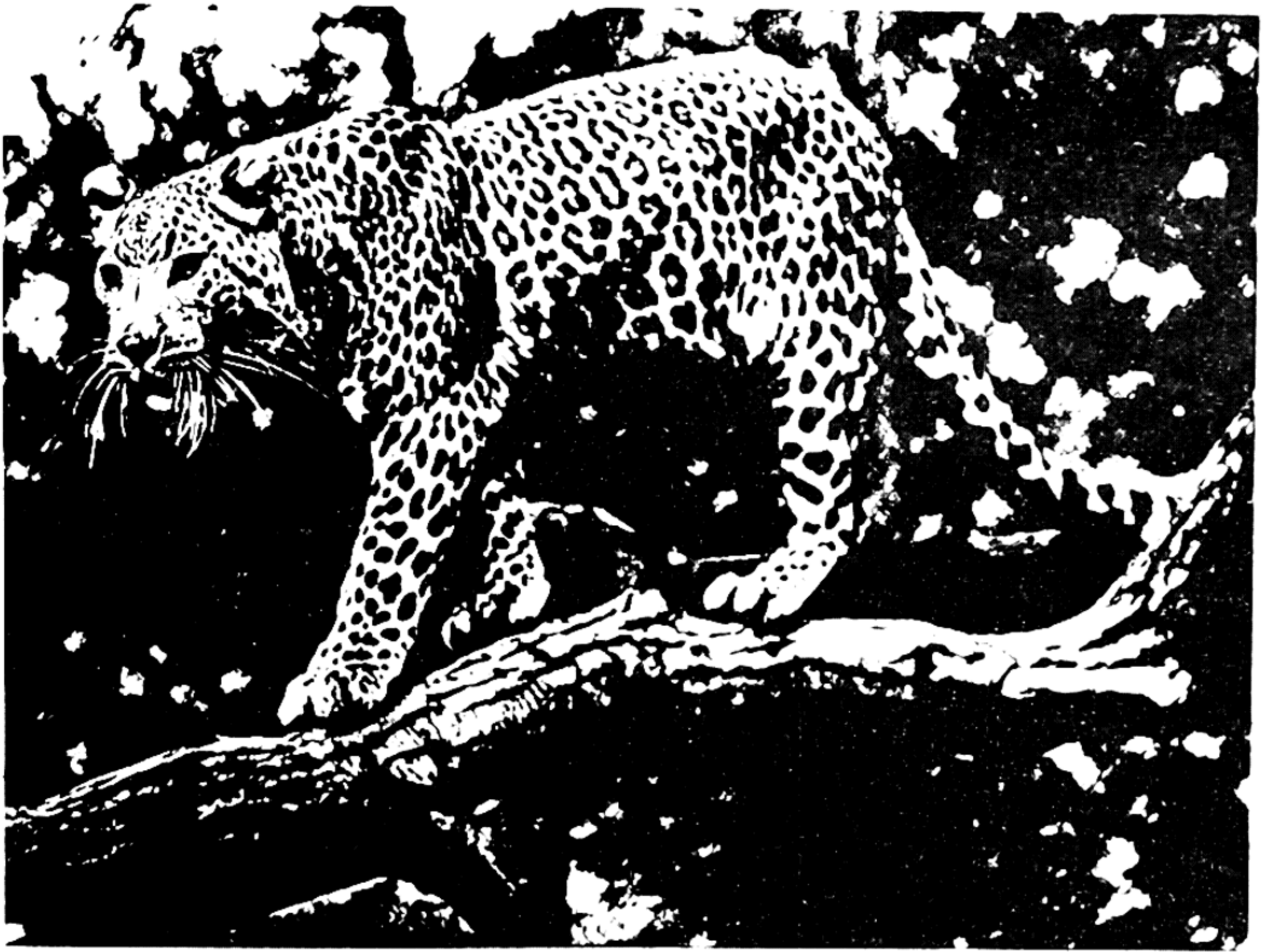
Tigers vary much more in colour and size than lions: Indian specimens are about the same size as lions.

TIGER—LEOPARD OR PANTHER

pigs, cattle and goats ; but like lions, they will eat carrion and, when hungry, frogs, tortoises, lizards, fish and even insects.

As a rule, Tigers are afraid of man ; but there are many instances of Tigers becoming inveterate " man-eaters " when the stimulus of hunger has overcome their timidity, leading to the discovery that man is naturally defenceless and easily killed.

Tigers are not so gregarious as lions, and usually occur singly or in pairs. When several are seen together, they are, as a rule, a family party consisting



[H. Bastin.]

LEOPARD OR PANTHER (*Panthera pardus*).

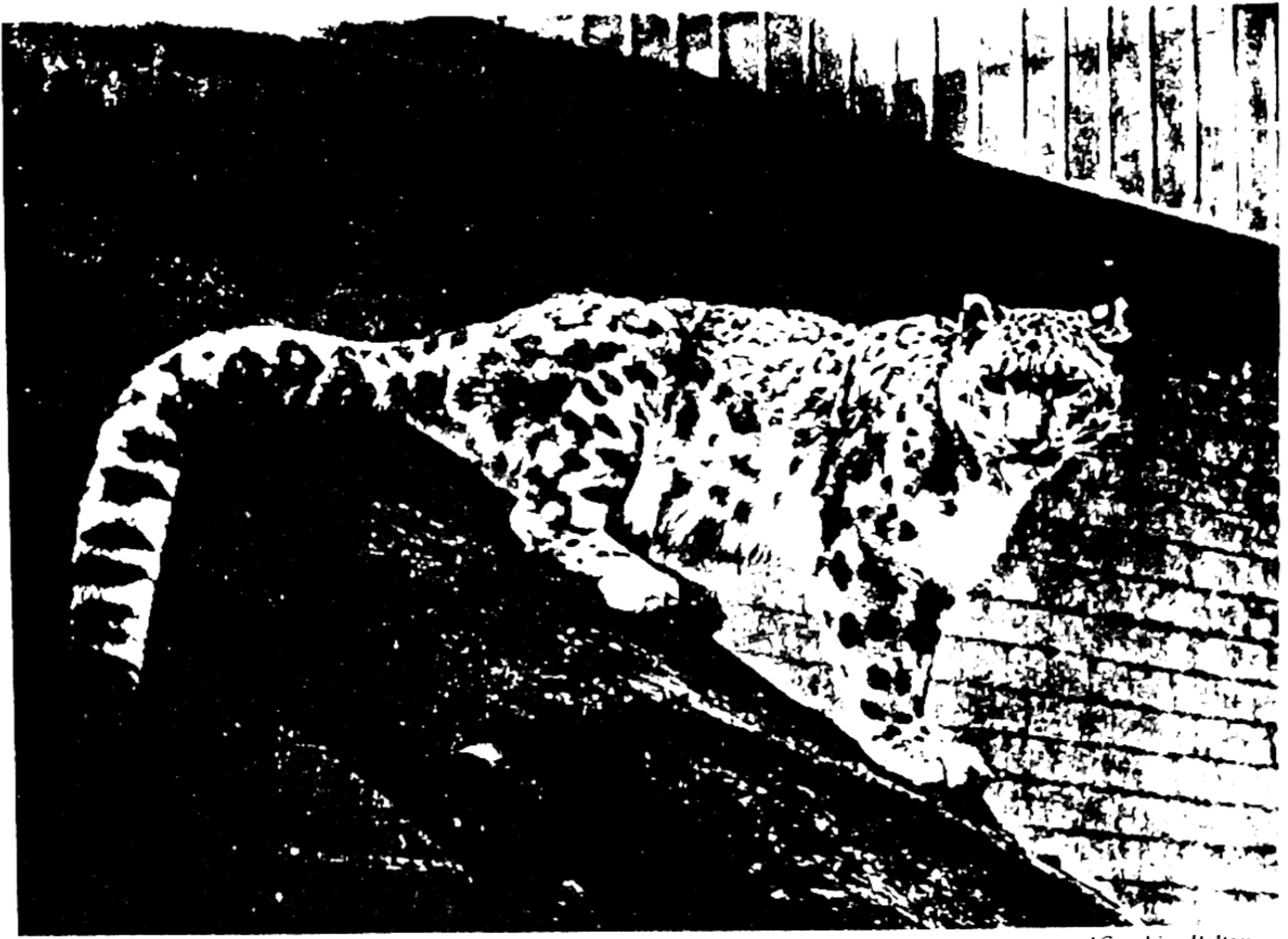
Leopards are tree climbers and frequently lie in ambush along branches overhanging a forest path on the watch for prey passing beneath.

of the Tigress and her cubs, sometimes, but not often, accompanied by the Tiger. Three or four cubs usually constitute the litter ; and the period of gestation is probably the same as in lions.

Unlike lions, Tigers seldom breed in captivity, although for over a century they have been crossed with lions in menageries, the resulting hybrids, which may favour either parent in general colour, being sterile.

Leopard or Panther (*Panthera pardus*). The Leopard is distinguished from the lion and tiger by its spotted pattern, its relatively longer tail and smaller size. A large male, however, is hardly inferior to the small tigresses

MAMMALIA (ORDER CARNIVORA)



[Gambier Bolton.]

OUNCE OR SNOW LEOPARD (*Panthera uncia*).

The fur in the winter is luxuriant and woolly, a protection against the extreme cold of Central Asia and the high Himalayas.

of Java. The pattern is of the rosetted type, each rosette being composed of four or five solid spots forming a round or angular figure enclosing a pale central area darker than the ground colour and sometimes containing one or more small black spots. But both colour and pattern are subject to much variation. The commonest variety is the Black Leopard met with in Abyssinia and the East Indies.

Although restricted to the Old World, the Leopard exceeds in its range that of the lion and tiger combined. It occurs in Europe to the east of the Black Sea, and is found all over southern Asia, northward to Amurland and southward to Java and Ceylon, its presence in Ceylon showing that it entered India before the tiger. Except in the Sahara, it has established itself almost everywhere in Africa, even in the forested Congo area which the lion does not enter. At one time it was supposed that there were two distinct kinds, the Panther and the Leopard, living side by side in various parts of the world. But this mistake was chiefly due to ignorance of the differences between the sexes, males being called Panthers and females Leopards. Now it is generally agreed there is but one species represented by a number of local races differing in colour in accordance with varied habitats.

SNOW LEOPARD OR OUNCE

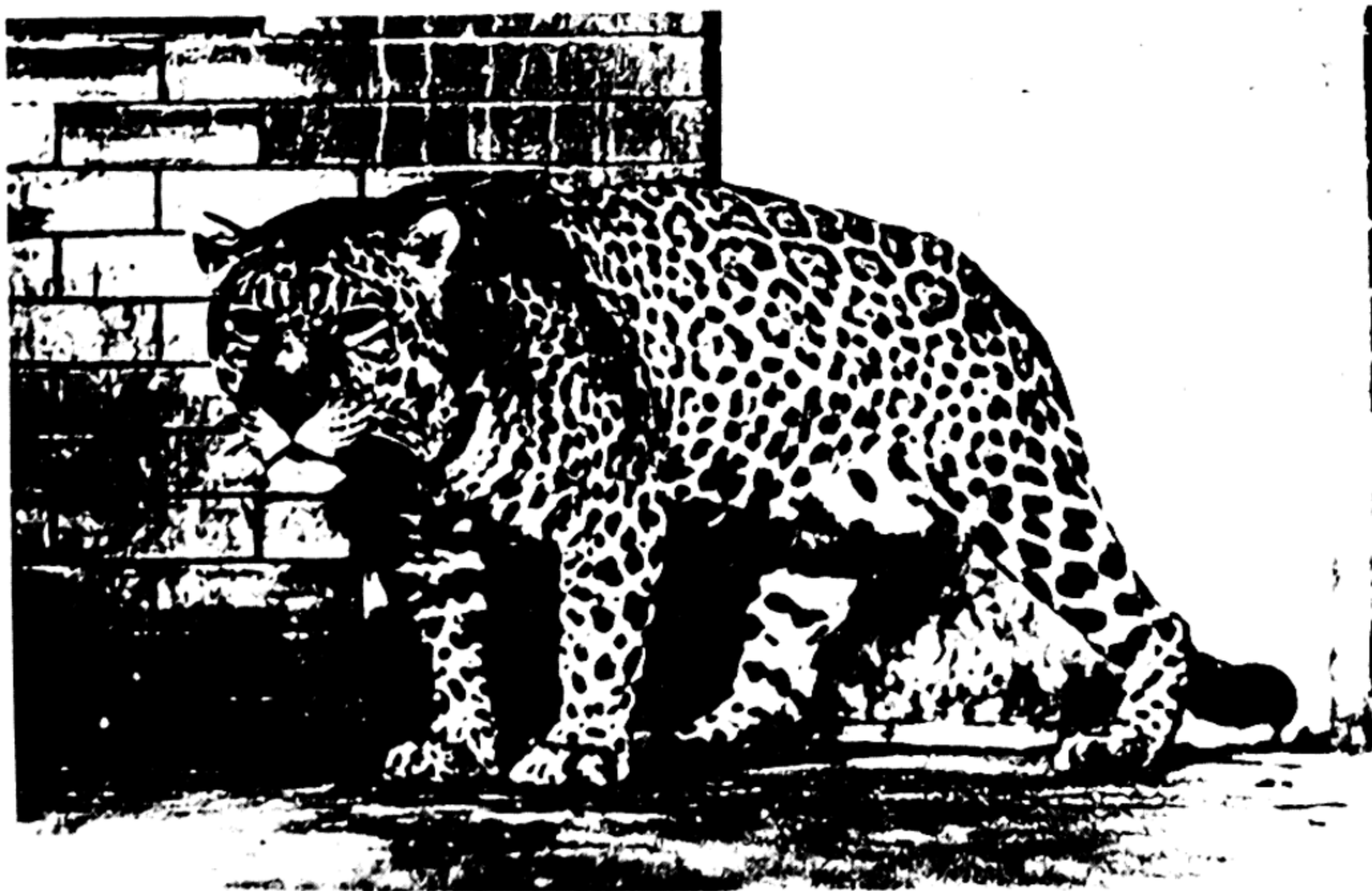
The dominant type is the ordinary yellowish Leopard of India and East Africa ; the Javan Leopard is smaller and more rusty in hue ; the Black Leopard replaces the spotted in southern Malaya ; the Persian Leopard, inhabiting arid hill tracts, is, on the contrary, almost grey and grows such a luxuriant coat in winter that it has been mistaken for the Ounce.

The voice of the Leopard is like a deep, rapidly-repeated, barking cough, comparable to the sound made by a coarse saw passing through hard wood.

It is needless to discuss the habits of Leopards, since they agree closely with those of lions and tigers, except that Leopards, by reason of their greater activity and smaller size, are tree climbers and frequently lie in ambush along branches overhanging a forest path on the watch for prey passing beneath. They are seldom dangerous to man unless wounded or cornered.

The height of a Leopard is between two and two and a half feet and the total length about seven feet, of which the tail is rather less than three feet.

Snow Leopard or Ounce (*Panthera uncia*). Although about the same size, this is a less powerful animal, with smaller head, weaker jaws, and a longer tail than the Leopard ; the rosettes, too, are larger, fewer and on the back form three longitudinal stripes. The colour is typically grey, generally with a tawny wash, and the fur in the winter is luxuriant and woolly. This is a protection against the extreme cold of central Asia and the high Himalayas where the Snow Leopard lives, and its general tint harmonizes with the



[Photopress.]

JAGUAR (*Panthera onca*).

The Jaguar can be distinguished from the Leopard by its larger head, shorter tail and more robust build. As a rule, too, the rosettes are larger and fewer.

MAMMALIA (ORDER CARNIVORA)

rocky ground the animal frequents. It preys upon animals ranging in size from wild sheep and hares to the little picas no larger than guinea-pigs. Its skin in the winter coat is greatly prized by furriers.

Jaguar (*Panthera onca*). This is the most powerful of the *Felidae* found in America, where it is the sole representative of the leopard group. It closely resembles the leopard in colour, pattern, voice and habits, but may be distinguished by its larger head, shorter tail and more robust build. As a rule, too, the rosettes are larger and fewer, the skin in consequence being handsomer. Its range is from Texas to the Argentine. In the latter country it is found in the treeless pampas, and preys upon the deer and smaller mammals; but the forests farther north are its headquarters, and here it occurs both in the low-lying districts of the great rivers as well as in the mountains. Although not so active as the leopard either on the ground or in trees, the Jaguar is a good climber and frequently lies in wait on the branch of a tree for deer, capybaras, or peccaries passing beneath. Fish also it preys upon, scooping them from the rivers with a dexterous stroke of the paw. Fresh-water turtles, too, it takes when they come ashore; and is said to dig up their eggs buried in the river banks. Like the leopard, the Jaguar is addicted to melanism, especially in the moist Amazonian Valley. A very large male may reach nine feet in total length, the tail being about two and a half feet.

Puma or Cougar (*Puma concolor*). This is the largest of the second group of Cats, and is about the size of a leopard, but, when adult, is uniformly tawny or pale brown in colour. It was formerly, on account of its tint, supposed to be related to the lion; but the pattern of the cubs, no doubt the pattern of the ancestral form, is entirely different from that of lion cubs; and there is no close kinship between the two species, the Puma being more nearly allied to the house cat.

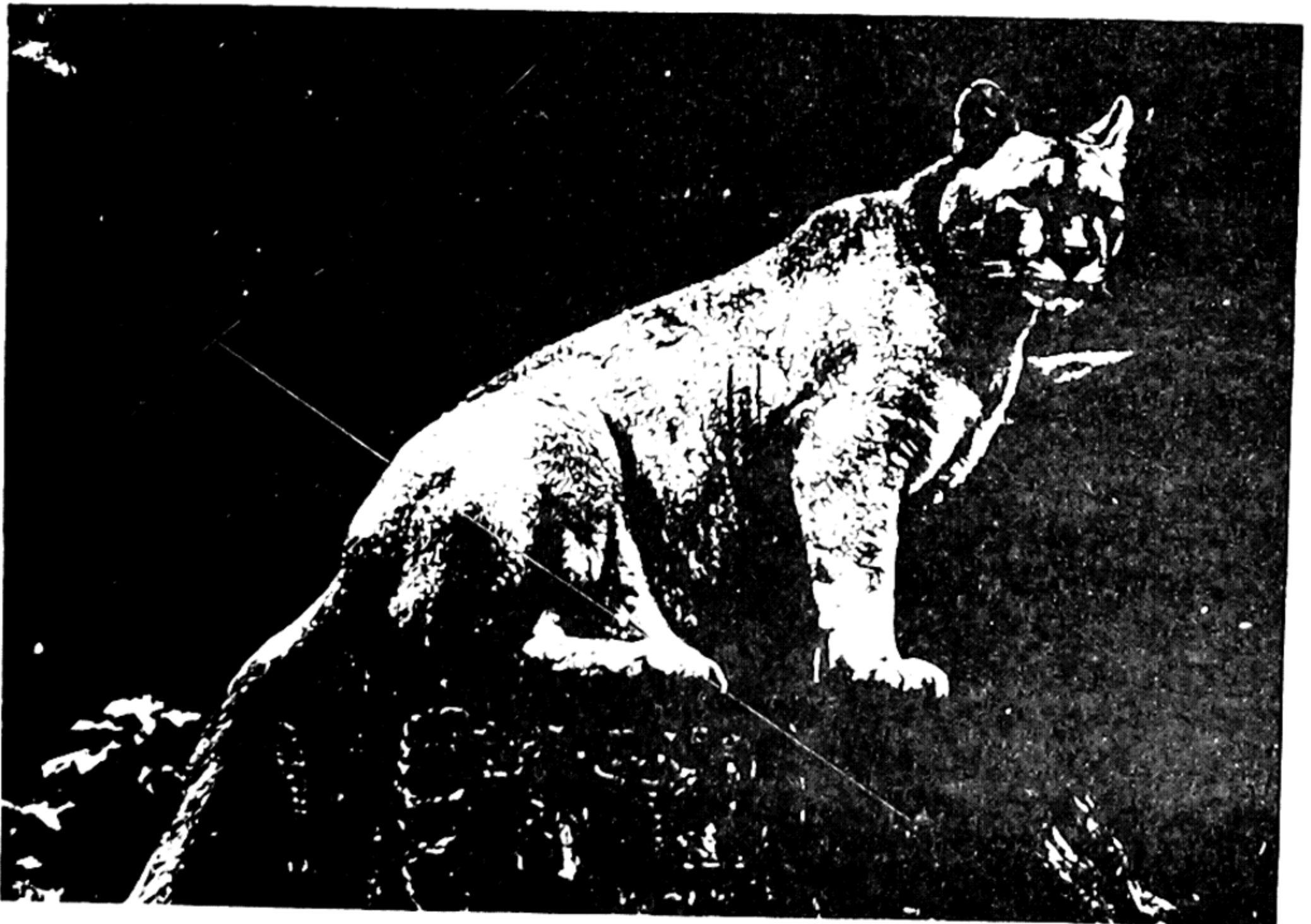
The range of this animal in America is almost as extensive as that of the leopard in the Old World. It extends from the confines of Canada to Patagonia, although it has been killed out in all the settled districts of the States. Its adaptability to varied habitats is unusual. In South America, for instance, it lives alike in the low-lying forests of the Amazons, where it chases monkeys in the trees, and up to the snow-line in the Andes, where it preys on the guanaco. It is powerful enough to kill horses; but nothing comes amiss to it from deer and farm-stock to guinea-pigs and birds of various kinds. Yet it seems to be a well-established fact that this powerful cat never makes an unprovoked attack on man and seldom, if ever, kills even children.

Clouded Leopard or Clouded Tiger (*Neofelis nebulosa*). This big cat is miscalled, as it is not related to the leopard. Next to the leopard and cheetah it is the largest species inhabiting the Old World. It is, however, much less powerful than the leopard. It has a longish head, with great upper canine teeth, short legs and a



[F. W. Bond.]

CLOUDED LEOPARD OR CLOUDED TIGER (*Neofelis nebulosa*).
 This is one of the handsomest members of the Cat family, its colour being greyish-brown, relieved by large, irregular, darker blotches bordered with black.



[H. S. Thorne.]

PUMA OR COUGAR (*Puma concolor*).
 The Puma extends from the confines of Canada to Patagonia, although it has been killed out in most of the settled districts of the United States.

MAMMALIA (ORDER CARNIVORA)



[W. S. Henshaw.]
EGYPTIAN OR FETTERED CAT (*Felis ocreata*).
An African species tamed by the ancient Egyptians.

very long tail and is one of the handsomest members of the Cat family, its colour being greyish-brown, relieved by large, irregular, darker blotches bordered with black. It is found in south-eastern Asia, ranging from the eastern Himalayas to Borneo and Formosa. In habits it is mainly arboreal, feeding on birds and small mammals. The height is less than one

and a half feet, the total length about six feet, the tail being nearly as long as the head and body.

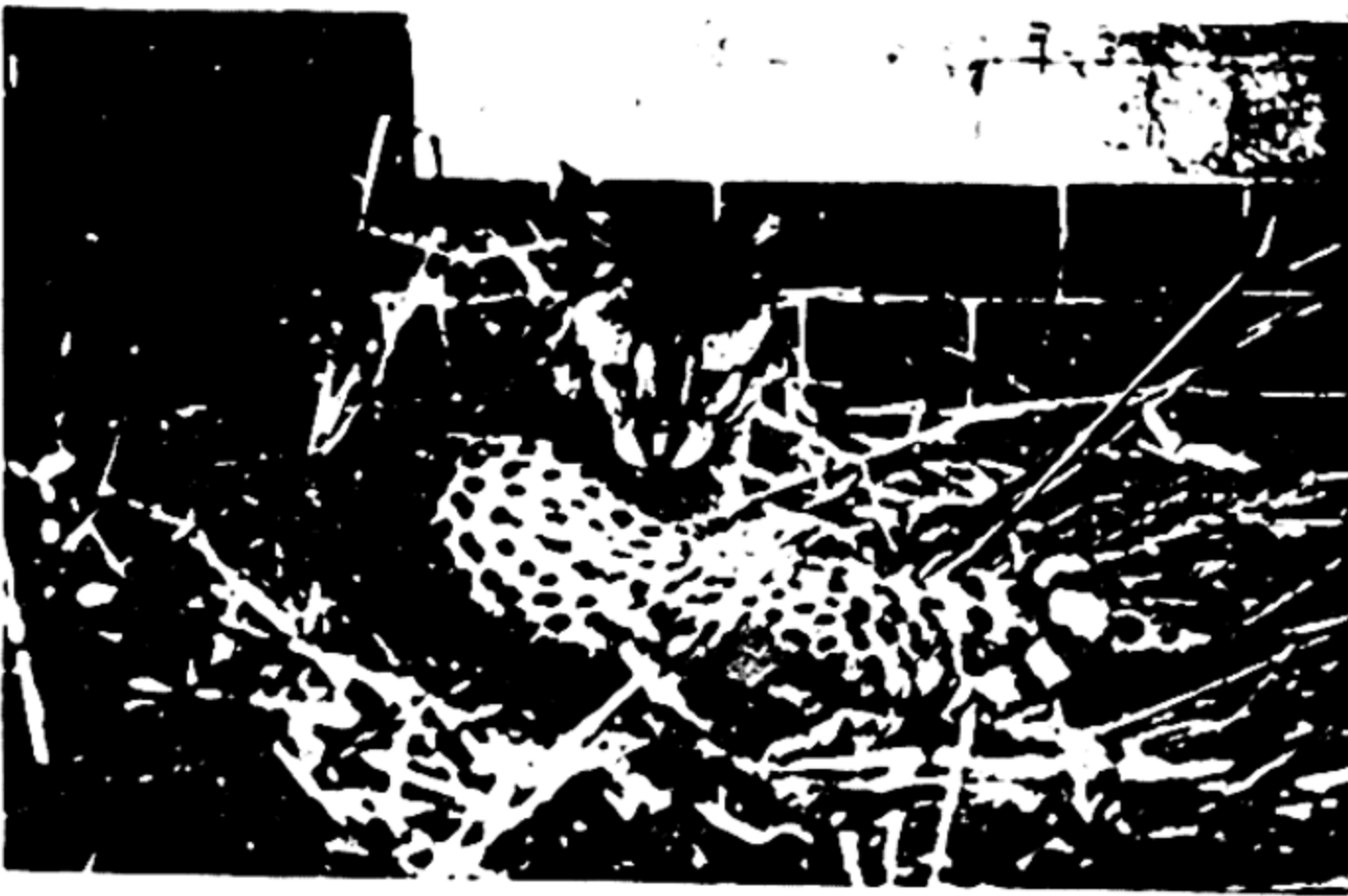
Serval and Ocelot. There are many other species of smaller cats inhabiting temperate and tropical districts of Asia, Africa and America, the best known being the Serval (*Leptailurus serval*) of Africa, a long-legged, rather short-tailed, spotted cat, distinguished by its large, rounded ears, set close together on the top of the head; and the Ocelot (*Leopardus pardalis*) of Central and South America, a strongly-built, savage cat, also rather short-tailed and typically banded with broad, longitudinal stripes, and further identifiable by its large, pink nose.

Perhaps the most beautiful of the smaller cats is the Golden Cat (*Profelis temminckii*), of eastern Asia. The body is a bright golden-bay and usually unmarked,



[F. W. Bond.]
LEOPARD OR BENGAL CAT (*Panthera tigris bengalensis*).
This cat of India, Malaya and China is a little smaller than our domestic cat.

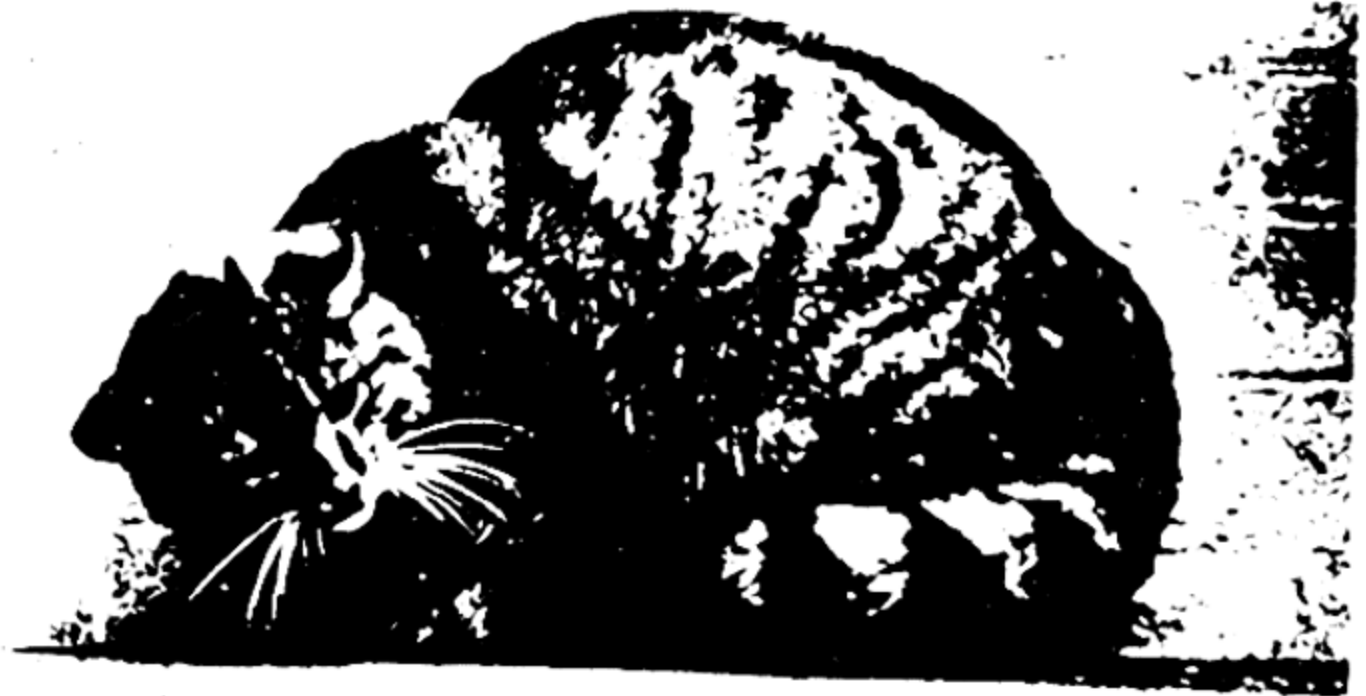
THE SMALLER CATS



SERVAL (*Leptailurus serval*).

This long-legged, rather short-tailed, spotted cat of Africa is distinguished by its large, rounded ears, set close together on the top of the head.

Dutch East Indies. Its pattern is like that of the Clouded Leopard. The Pampas Cat (*Lynchailurus pajeros*) is a very savage species inhabiting the pampas of the Argentine and Patagonia. The long, yellowish-grey hair of the body is banded obliquely with light brown, the legs being barred with



SCOTCH WILD CAT (*Felis silvestris grampia*)

This cat is now restricted to the northern mountainous parts of Scotland.



[Photos]

OCELOT (*Leopardus pardalis*).

A strongly-built savage cat of Central and South America, identifiable by its large pink nose.

[W. S. Berridge.]

the underparts being white. The eyes are large and pale yellowish-green, and the nose is pink. Striking, also, is the Marbled Cat (*Pardofelis marmorata*), which has the marbled markings on the body only, the tail being spotted and comparatively long. This species inhabits certain parts of the Himalayas, Burma, Malaya and the

darker brown. This cat is about the size of the European Wild Cat. Some other species are shown in the illustrations.

Common Wild Cat (*Felis silvestris*). This, however, is the most interesting of the smaller species. It was formerly found all over Great Britain, but is now restricted to the northern mountainous parts of Scotland, its

MAMMALIA (ORDER CARNIVORA)



[D. Seth-Smith.
PALLAS'S CAT

(*Trichailurus manul*).

This cat has a thick coat of long, soft, yellowish-grey hair. The tail and hindquarters are striped. Its home is central Asia.

banded and black-tipped. In Scotland, it makes its home in hollow trees or crannies in the rocks, and feeds on hares, rabbits, field-mice, grouse and other birds. But there is nothing peculiar in its habits. Its chief interest lies in its being, almost beyond doubt, one of the ancestors of our domestic cat, which it closely resembles in all essential characters.

There is, however, another very similar

range extending through central and south Europe as far as Asia Minor. In size this Cat agrees closely with the domestic cat, but looks a little larger on account of its thicker, longer fur and bushier tail. The general colour is brownish, with vertical black stripes on the flanks and hind-quarters, the hinder half of the tail being



[W. S. Berridge.
GEOFFROY'S CAT (*Oncifelis geoffroyi*).
This is a native of South America.

WILD CATS

but shorter-coated and longer-tailed Wild Cat (*F. ocreata*), an African species which was tamed by the Ancient Egyptians and was very possibly brought to Europe and crossed with the indigenous species. At all events, some fifty per cent. of the tame cats in



(W. S. Berridge.
VIVERRINE OR FISHING CAT (*Zibethailurus viverrinus*).
This cat lives partly on fish and frequents marshy regions in India and other countries of the East. It is of medium size.

the world, apart from specially-modified breeds, partake of the characters of these two wild species. Typically, these tame cats have vertical black stripes on the flanks, a pattern called "mackerel" by cat-fanciers. But there is another type of tame cat to which the term "tabby" probably belongs by rights, which has a very different pattern of bold, black stripes forming a characteristic curved, often spiral, arrangement on the flanks. It was this tabby which originally received the name *Felis catus*, long misapplied to the European Wild Cat. The origin of this tabby is unknown, but it lives alongside the "mackerel" and the two freely interbreed, but their patterns never get mixed. All our domestic cats, blacks, reds, whites, tortoiseshells, blues, Persians, Manx, and Siamese are traceable



By courtesy of the)

(Canadian Government, Dominion Parks Branch, Ottawa.
CANADIAN LYNX (*Lynx canadensis*).
This species is closely allied to the Common or Northern Lynx.

MAMMALIA (ORDER CARNIVORA)

either to the "mackerel" or "tabby" type; and no species but the European and North African Wild Cats, so far as is known, were concerned in the ancestry of the "mackerel." These two species are also of interest because they represent a group of Cats from which the Lynxes were derived.



[W. S. Berridge.

JUNGLE CAT (*Felis chaus*).

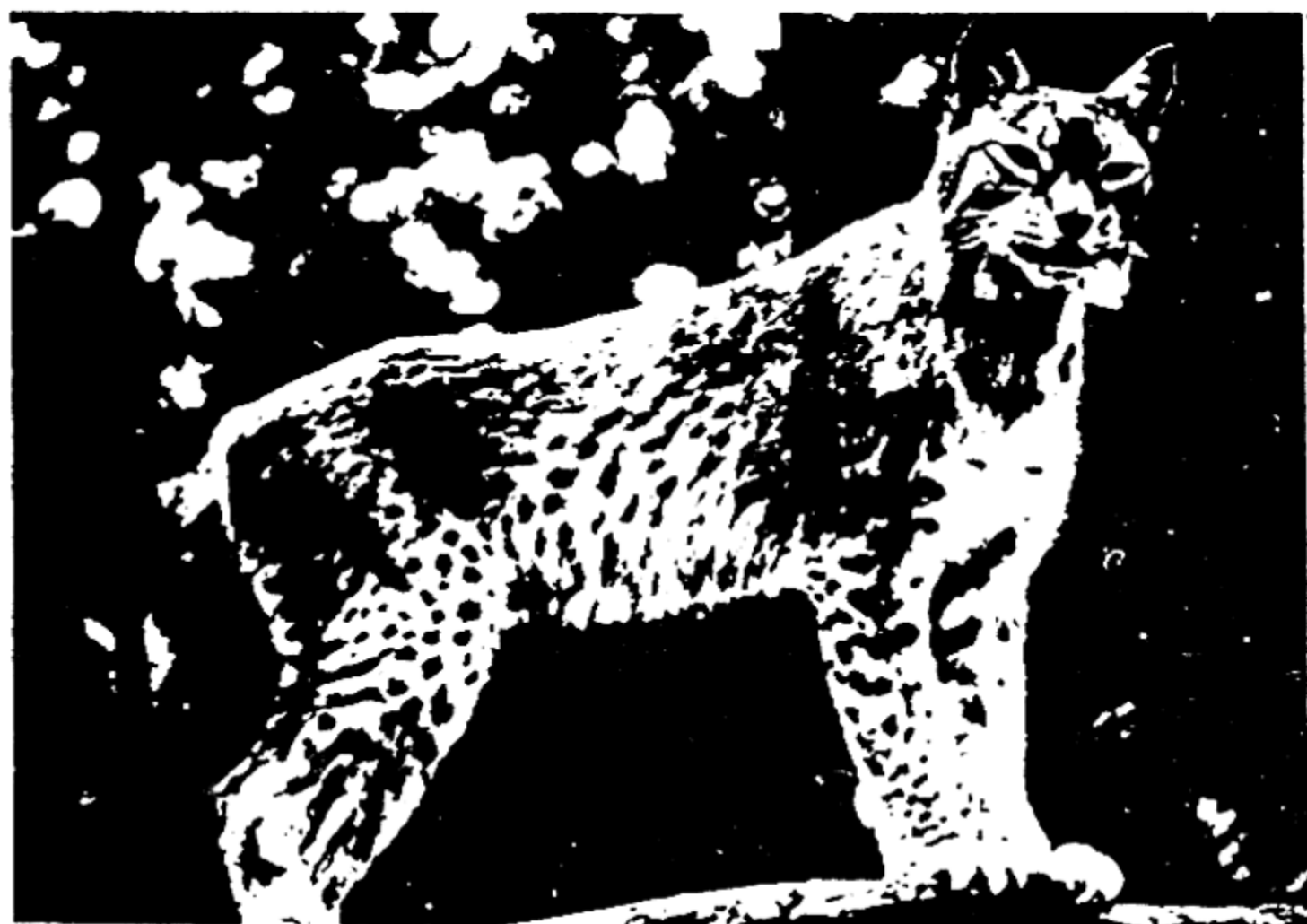
This cat, an intermediate species between the Wild Cats and the Lynxes, has a small tuft of hair on the ears.

Lynxes (*Lynx*).

The typical Lynxes differ from the Wild Cats just described in the shortness of the tail, the higher hindquarters, the presence of a whisker-like fringe on the cheek and of a tuft at the tip of the ear and in the circular pupil of the eye when contracted. But they are unmistakably closely related to the Wild Cats and are connected with them by several intermediate species. One of these is the Jungle Cat (*Felis chaus*) of India and Africa, which has a small tuft on the ear and a tail of intermediate length. In one of the typical Lynxes, too, the Bob-tailed Cat (*Lynx rufus*) of North America, the ear

tuft is comparatively small and this species has been aptly described as "an overgrown house cat," which it resembles in "mewing, yowling and caterwauling."

Of the true Lynxes the best known is the Common or Northern Lynx (*L. lynx*), which varies locally and seasonally in colour, from reddish to grey, and is sometimes spotted, sometimes not. The head and body



[Sport & General.

COMMON OR NORTHERN LYNX (*Lynx lynx*).

This Lynx varies locally and seasonally in colour from reddish to grey and is sometimes spotted, sometimes not.

LYNX—CARACAL



[W. S. Berridge.

BOB-TAILED CAT (*Lynx rufus*).

This is one of the typical lynxes in which the ear tuft is comparatively small, and which has been aptly described as "an overgrown house cat."

measure about three feet and the tail five inches long. It is a powerful beast, at times killing animals as large as sheep, but preying mostly on smaller mammals and birds. It is now very rare in Europe, but a few may survive in the Alps, Scandinavia and Russia. In central Asia it is more plentiful and in the Himalayas is found at altitudes of 10,000 feet and more. A distinct species, the Southern Lynx (*L. pardellus*), is found in Spain and Asia Minor. The

Canadian Lynx (*L. canadensis*) is more nearly allied to the Common Lynx.

Caracal (*Caracal caracal*), always known to sportsmen in Africa, Arabia and India, where it lives, as the Lynx, is a species which connects the true Lynxes with the Wild Cats, having no fringe on the cheek and a tail reaching to the hocks. It is not thick furred like the Northern Lynxes and is a uniform tawny-brown, with blackish ears. The head and body measure about two and a half feet and the tail is about nine inches long. In some parts of India it is trained to catch hares, small deer and other game, and has been described as extraordinarily swift of foot.

Cheetah [Chita] (*Acinonyx jubatus*). This animal is sometimes called the Hunting Leopard, and is distinguished from the typical members of the Cat family by being adapted for running down swift-footed prey



[James's Press.

CARACAL (*Caracal caracal*).

This animal connects the true lynxes with the Wild Cats, having no fringe on the cheek and a tail reaching to the hocks.

MAMMALIA (ORDER CARNIVORA)

over hard ground. The head is small and light, the body is compressed to offer as little resistance to the air as possible, the tail is long to aid in rapid turning, the legs are also long and slender, the feet are narrow, and are provided with hard pads and toes capable of being widely spread and armed with strong, straighter claws unprotected by the lobes of skin constituting the sheath. The



YOUNG CARACAL (*Caracal caracal*).

usual height is about two and a half feet and the weight about one hundred pounds. The colour in this species is some shade of sandy-fawn, relieved by numerous close-set, solid spots, with a characteristic black streak passing down the face from the eye, and there is generally a short mane on the nape.

The range is from central India, through Persia, and thence nearly all over Africa except the Congo forest. In India, where this animal was trained by the Rajahs for coursing Black-buck and Gazelles, it is nearly extinct, and specimens have been imported from East Africa to take its place in that sport. The custom is to take the Cheetah, hooded, on a bullock-cart as near a herd of antelopes as possible and then unhood and release it. On sighting the herd, the Cheetah, taking advantage of any scrub providing cover, creeps still closer before launching itself at speed towards its quarry. For a short distance, up to about a quarter of a mile



Photos] [W. S. Berridge.
YOUNG AFRICAN CHEETAHS (*Acinonyx jubatus*).
For a short distance, up to about a quarter of a mile or so, the
Cheetah is said to be the swiftest mammal known.

or so, it is said to be the swiftest mammal known. At all events, it can overtake these fleet-footed antelopes, and upon coming up with one, strikes it to the ground with a blow of the paw, then kills it by tearing its throat. Wild Cheetahs, however, usually prey upon smaller game.

In Southern Rhodesia there is another kind, the King Cheetah (*A. rex*), a much handsomer animal in which the spots tend to fuse in large blotches and stripes, especially on the back. This animal was at one time mistaken for a variety of the Common Leopard.

DOGS, WEASELS, BEARS and their Allies (*Arctoidea*)

In this, the second Suborder of typically terrestrial carnivores, the forepart of the nasal passages is blocked by a pair of scrolls of spongy bone arising from their side-walls, the scrolls arising from the back of the passages being comparatively short. Also the bulla of the ear is composed of a single bone.

To this Suborder belong: the Dogs and Foxes (Family *Canidae*); the Weasels, Badgers, Otters, etc. (Family *Mustelidae*); the Raccoons and their Allies (Family *Procyonidae*); the Pandas (Family *Ailuridae*), and the Bears (Family *Ursidae*).



[For Photos.]

TIMBER WOLVES.

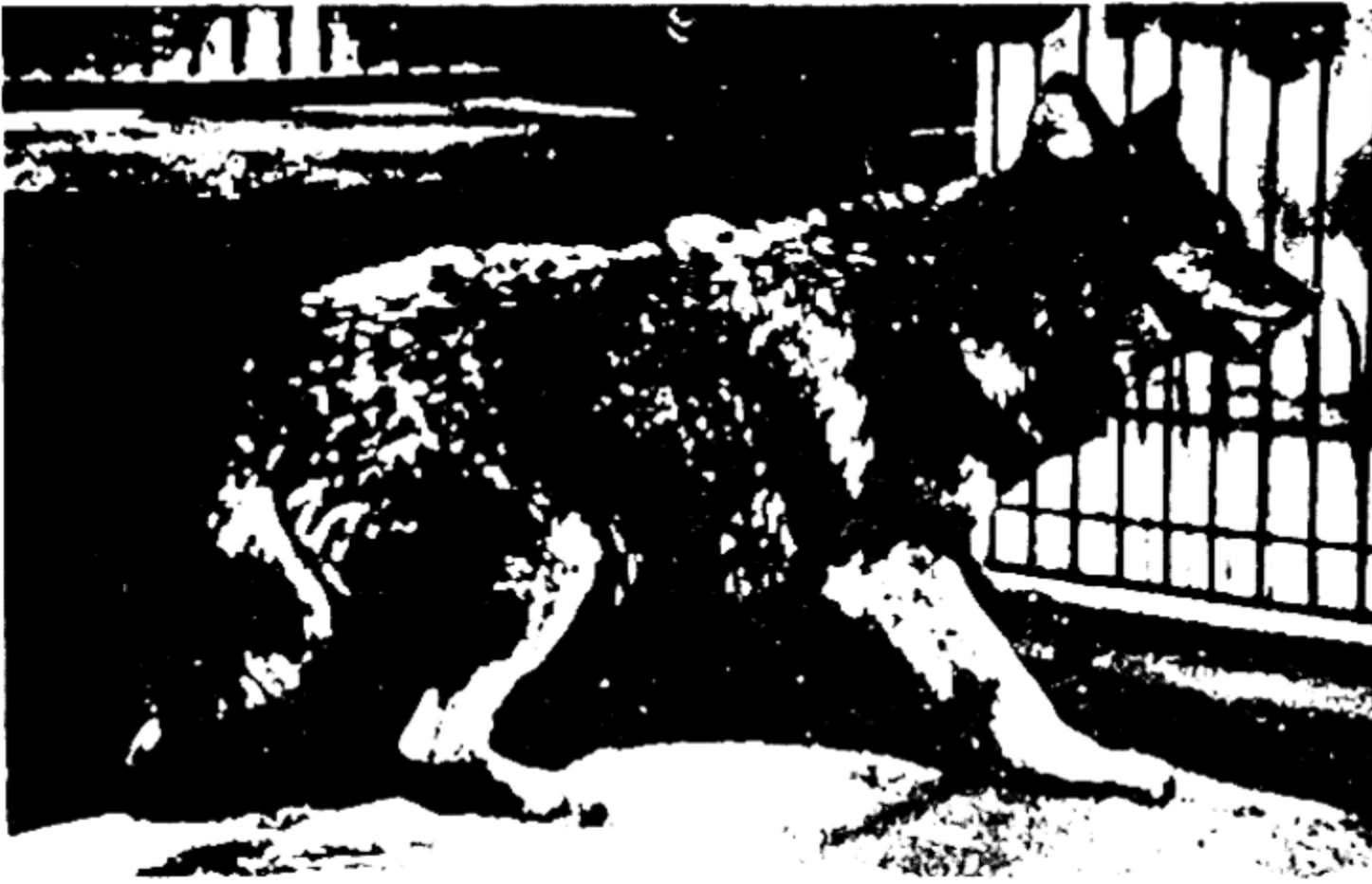
Most of the big wolves of North America are called Timber Wolves.

Of these, the Raccoons are restricted to America, the Pandas to Asia, the others occurring in both the eastern and western hemispheres.

Dogs, Wolves, Jackals and Foxes (Family *Canidae*)

This family is distinguished from other Arctoid Carnivores by being adapted for swift running in pursuit of prey, the feet being compact and completely digitigrade. The jaws are long, formed for snapping, and are provided with nearly the full complement of teeth, mostly well developed, the carnassials, with one exception, having high cutting blades. The

MAMMALIA (ORDER CARNIVORA)



NORTH AMERICAN PRAIRIE WOLF.

species are all terrestrial, none being modified for aquatic or arboreal life.

There are two subordinate groups, the *Canine* (Dogs, Wolves, Jackals) and the *Vulpine* (Foxes). In the Canine Group, the forehead of the skull is swollen with air-cells; in the Vulpine Group it is flat.

Canine or Wolf, Jackal and Dog Group

Wolf (*Canis lupus*). The typical Wolf, although now exterminated in most settled districts, was formerly distributed all over the northern hemisphere, from the Arctic Regions as far south as the Mediterranean, Arabia and India in the Old World and as Mexico in America. It has become adapted to a great variety of environments and climate and is represented by a large number of local races differing in colour, size and thickness of coat, the largest, handsomest and most formidable animals being found in northern, cold districts.

The *European Wolf* has a long, shaggy coat, usually of black and grey or tan hairs overlying a dark underwool, the tail being of the same tint and bushy, but the legs are covered with short tan-tinted hairs; the individual variation, however, is considerable. In the plains of northern India, it is replaced by the *Pale-footed Wolf*, a smaller, greyer animal, with little or no under fur. In northern Siberia the Wolf is larger and nearly white, and a very similar Wolf, called the *Tundra Wolf*, is found



[Photos]

[W. S. Berridge.]

WOOLLY WOLF FROM TIBET.

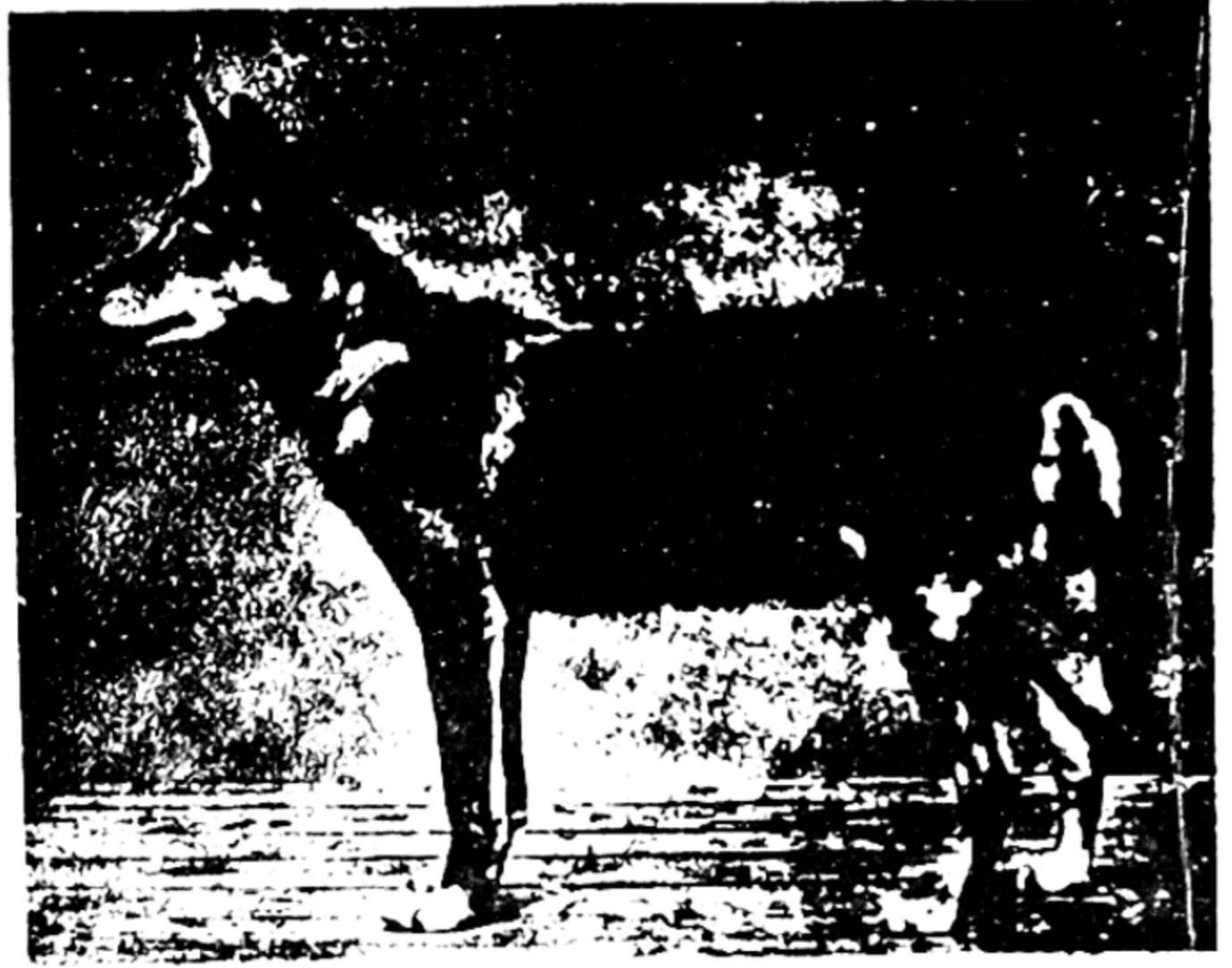
WOLVES

in the barren grounds of Canada. But most of the big Wolves of North America are called *Timber Wolves*, some being coloured like the European Wolf, some greyer, the Texan race being known from its tint as the *Red Wolf*; Black Wolves have been recorded from Russia, Tibet, Alaska and Canada. The height of the European Wolf is about two feet four inches.

Wolves are essentially predatory and in severe winters of northern countries frequently combine in packs for the pursuit of prey. At such times and when pressed by hunger, they are bold and attack man and in America such formidable game as the Moose, Musk Ox and Bison; and are liable to inflict great damage on farmers by raiding their live stock. As a rule, they are comparatively solitary, seldom more than two or three being seen together. They pair once a year in the winter and the period

of gestation, as in dogs, is nine weeks. Hence the cubs, which are black at birth and usually four or more to the litter, are born in the spring. Full size and strength are reached in about three years.

There is no known structural difference between Wolves and big domesticated dogs, except that dogs have relatively smaller teeth and smoother coats, lacking the long, loose, harsh hairs of Wolves. They have been repeatedly crossed and produce fertile



[Gambier Bolton.]

AUSTRALIAN DINGO.

This was no doubt introduced into Australia by the Aborigines who came from Asia.



INDIAN WOLF.

[W. S. Berridge.]

MAMMALIA (ORDER CARNIVORA)



[W. S. Berridge.
SIBERIAN WILD DOG OR DHOLE (*Cuon javanicus alpinus*).
The rusty-brown coat of this dog turns fawn in winter.

offspring. All the evidence, indeed, points to the conclusion that the Wolf was the main stock whence our domesticated breeds were derived.

Dingo or Australian Wild Dog. This was no doubt introduced into the country by the aborigines who came from Asia. But the first European settlers found it wild and preying upon Kangaroos, Wallabies, etc. It soon, however, took to attacking their sheep and a war of

extermination was waged against it in all the settled districts. It crosses readily with European dogs and pure-bred examples are now difficult to obtain; but from all accounts it was originally fawn in colour, two feet or less in height and resembled domesticated dogs in its smooth coat and small teeth.

Prairie Wolf. In addition to the bigger "Timber" Wolves, there are several smaller kinds ranging in America from southern Canada into Mexico. These are usually known comprehensively as the Prairie Wolf or Coyote (*C. latrans*). It is more addicted to living in burrows and more omnivorous in diet than the Timber Wolf, and by reason of its smaller size, much less destructive, preying mainly on hares, mice, and birds, but sometimes combining in small packs to hunt the prongbuck, which being too fleet for the united pack, is chased in relays.

Jackals. The name Jackal is given to several species which are about the size of a Fox-terrier, but which have thick, coarse coats and bushy tails, like Wolves, and a generally "foxy" aspect. The Common Jackal (*Canis aureus*) still lingers in eastern Europe, whence it extends through southern Asia as far as Burma and is plentiful throughout India and Ceylon. In colour it much resembles the European Wolf. It is omnivorous in diet, feeding on hares, mice, birds and carrion, varied with such vegetable food as sugar-canes, maize and coffee-berries near plantations. It will also take offal and carrion and is a useful scavenger in the East. The Egyptian Jackal (*C. lupaster*), a larger animal standing some sixteen inches at the shoulder, is sometimes called "wolf" in its native country.

The handsomest of the species is the Black-backed Jackal (*C. mesomelas*), found in East and South Africa. It is even more "foxy" in appearance

WILD DOGS—DHOLES

than the Asiatic Jackal on account of its larger ears, but its distinguishing mark is the saddle of black and white hairs covering the back and sharply contrasted with the reddish-brown tint of the flanks and legs.

Wild Dogs. Many species of Wild Dogs, generally called foxes from their appearance and smallish size, one or two only being large enough to be known as wolves, are found in South America, inhabiting the Andes, the tropical forests and the open plains as far south as Cape Horn. The largest, the Red or Maned Wolf (*Chrysocyon brachyurus*), is like a gigantic fox with a very short body and extremely long legs. It lives in the open bush of Brazil and the Argentine and feeds upon rodents, birds, fruit sometimes and, being as big as a wolf, is strong enough to attack sheep. The name "Wolf" was also given to another species (*Dusicyon australis*), although it was only as large as a big jackal, which was restricted to the Falkland Islands but is now extinct. The term "Fox" is generally applied to two groups, each containing several species, represented by Azara's Fox (*Pseudalopex gymnocereus*), which is common in the Argentine pampas and very fox-like in appearance and size but greyer in tint; and by the Crab-eating Fox (*Cerdocyon thous*), a darker, smaller-eared dog found in the forests of Venezuela and Brazil. Finally, there is a curious little dog, the Bush Dog (*Speothos venaticus*), somewhat badger-like in build, but not so heavy, which on account of its dentition is sometimes regarded as related to the Dholes. It usually frequents the river-sides of Venezuela and Brazil, and eats crabs, cavies and other small animals.

Red Dogs or Dholes (*Cuon*). The Red Dogs, known in India as Dholes, are a small group of Wild Dogs hardly larger than big jackals but more sturdily built, especially in the muzzle, and distinguished by the loss of the last lower molar tooth. There is one species (*C. javanicus*) which ranges from India and Java in the south to the Altai and Amurland in the north. The southern races are comparatively short-coated and uniformly red throughout the year, but the northern races grow a very thick coat and sometimes turn nearly white in winter.

These dogs frequent



[W. S. Berridge.]

JACKAL.

Jackals are about the size of a Fox-terrier and have thick, coarse coats and bushy tails like wolves and a generally "foxy" aspect.

MAMMALIA (ORDER CARNIVORA)

forests and hill-sides. They hunt in packs, averaging a dozen or more individuals, and prey upon wild pigs and deer, as large as sambur, instances in India being known of them destroying even tame buffaloes and cattle. In combination, they exhibit great courage and there are recorded cases of attacks by them on bears, leopards and tigers. Mainly nocturnal, they lie up in holes, rock-crevices and thick bush by day; and the pups, born in the early months of the year, are usually from four to six in number.

Hunting Dog (*Lycaon pictus*). This is also called the Hyaena Dog, and is about the size of a small wolf, but has a more massive head and muzzle, much larger, rounded ears and is tortoiseshell in colour, the yellow, black, and sometimes white blotches being variously blended, but it differs



[F. W. Bond.]

MANED OR RED WOLF (*Chrysocyon brachyurus*).
This is a wild dog that lives in the open bush of Brazil and the Argentine. It is like a gigantic fox with a very short body and extremely long legs.

from all the other species of the Dog Family, and resembles the hyaenas in having no dew-claw on the fore foot. This animal inhabits the bush and plains of East and South Africa and feeds mainly on buck of various kinds, killing even such large species as the hartebeest, thegnu and the sable antelope. It hunts in packs, usually composed of from fifteen to a score or more individuals. Although seldom attacking man, this dog is a great

pest to owners of cattle and sheep. The pups, sometimes a dozen in number, are born in large burrows.

Vulpine or Fox Group

Except that the pads of the feet are more hairy and the tail, as a rule, longer and bushier, there is no external feature by which Foxes can be distinguished from wolves, dogs and jackals.

Arctic Fox (*Alopex lagopus*). This species, however, is nearly intermediate between the two groups, but is unmistakably a Fox in its feet and tail, although its ears are shorter and rounder. It inhabits the Arctic Regions as far south as the northern limit of tree—growth in both the Old and the New World. It feeds upon birds and their eggs, arctic hares,



[W. S. Berridge]

EAST AFRICAN HUNTING DOG (*Lycaon pictus*).

This dog hunts in packs of from fifteen to a score or more individuals, killing even such large species as bartolet and sable antelopes.



[F. W. Bond]

CRAB EATING FOX (*Cerdocyon thous*).

This dog is found in the forests of Venezuela and Brazil.

MAMMALIA (ORDER CARNIVORA)



[Photopress.]

FENNEC FOX (*Vulpes zerda*).

This is a very small, sandy-coloured species with gigantic ears, inhabiting the Sahara.

lemmings, crabs and any animal food it can find; and in the winter, either migrates southwards where food is to be had or stores up dead lemmings in rock crannies against the time of scarcity. It exhibits two colour phases. The normal type changes its colour seasonally, growing a luxuriant white coat in the winter, whereas in the brief summer months it is short-coated and white only below, the upper parts being brownish and speckled with buff. The other phase is a permanently dark variety, greyish or brownish throughout the year. This phase is known as the "Blue Fox", in the fur trade, the other as the "White Fox," the skins being of value only in the winter. The number of pups is usually about six, but sometimes as many as eleven.

Common or Red Fox (*Vulpes vulpes*). This Fox may be distinguished in all its numerous races by the black patch on the back of its ears and the white tip or "tag" to its tail or brush. It overlaps the Arctic Fox in its northern distribution, but extends as far south as North Africa, Arabia, India and the southern states of North America, holding its own alike in the barren tundras, in forested and desert districts. It varies locally in size, colour and luxuriance of coat, northern latitudes producing in every way the finest specimens. The smallest and palest race is the *White-footed Fox* of the deserts of the Punjab and Persia. Northern races are richer and darker in tint and frequently exhibit marked individual variation in colour in accordance with the proportion of red, black or grey in the hairs. The best instance is supplied by the Canadian race, where the ordinary

THE VULPINE OR FOX GROUP

Red Fox of the country, hardly distinguishable from the European Fox, occurs in at least two other well-marked phases, known to the furriers as the *Cross Fox*, which is half black and half red, and the *Silver Fox*, which in its most valued type is black, with scattered, silver-tipped hairs. This type is now being successfully bred on "fox-farms" both in America and Europe. Most of the red fox furs worn as wraps come from Australia, where English foxes imported many years ago, to keep down rabbits, have increased beyond all expectations.

The habits of Foxes, wherever found, appear to be similar. They feed upon small mammals, birds, eggs, reptiles and even insects and occasionally eat fruit, the precise nature of their diet varying with the country they inhabit. They are nocturnal and many, like the European Fox, but not all, have eyes like the house cat, with slit-like pupils when contracted. They are extremely wary, quick-sensed and swift, able to cover rough ground at great speed and even to ascend easily climbable trees, if pushed. They lie up at night in burrows, crannies of rocks or in scrub; and, as is well known, have very highly-developed instincts, regarded by some as intelligence, in avoiding traps, "breaking scent" and in other ways. The cubs, usually four or five in number, are born after a gestation period of



[W. Cooper.]

COMMON OR RED ENGLISH FOX (*Vulpes vulpes*).
The ground-scent left by the Common Fox is due to glands in the soles of the feet.

MAMMALIA (ORDER CARNIVORA)



ARCTIC FOX (*Alopex lagopus*).

This fox inhabits the Arctic Regions as far south as the northern limit of tree—growth in both the Old and the New World.

nine weeks, in the early spring, and are capable of breeding by the autumn of the next year. It may be added that, in spite of a prevalent belief to the contrary, there is no authentic case of the European Fox, or any other, crossing with

dogs. Experiments, indeed, have shown that this Fox is sterile with the Arctic Fox. The ground-scent left by the Common Fox is due to glands in the soles of the feet.

There are many other species of Fox living in various parts of the world, all smaller than the Common Fox and without the black ears and white tag. Of these the best known are: the Bengal Fox (*V. bengalensis*) of Hindustan, a small, grey Fox, without the scent of our species; the Fennec Fox (*V. zerda*), a very small, sandy-coloured species, with gigantic ears, inhabiting the Sahara; the Silver-backed Fox (*V. chama*) of South Africa, which is the most southern of all the True Foxes and the Kit Fox (*V. velox*), another small species inhabiting the prairies of North America. Another common North American species, called the Grey Fox (*Urocyon cinereo-argenteus*), which is grey and buff in colour, differs from ordinary Foxes in having a crest of stiff hairs along the upper side of its tail. It is the



[Photos]

[W. S. Berridge.

BENGAL FOX (*Vulpes bengalensis*).

This is a small grey fox without the scent of our species.

THE VULPINE OR FOX GROUP



By courtesy of)

BLACK VARIETY OF THE NORTH AMERICAN RED FOX. [The High Commissioner for Canada.

only Fox which spreads into South America. In South and East Africa there is a peculiar species known as the Long-eared Fox (*Otocyon megalotis*), which differs from all the other members of the family in the greater number of the cheek teeth and the shape of their sharply-cusped crowns, fitted for masticating white ants, on which the animal principally feeds, although it will eat small mammals, birds, etc., as well. It is not so strongly built as the Common Fox, is generally darkish-grey in colour, and has very large ears.



NORTH AMERICAN GREY FOX (*Urocyon cinereo argenteus*)

[F. W. Bond.

MAMMALIA (ORDER CARNIVORA)

Weasels, Martens, Skunks, Badgers and Otters (Family *Mustelidae*)

This family differs from the preceding in having shorter jaws, the ears small and rounded, and the limbs shorter, with the feet less compact and never so completely digitigrade. The cheek-teeth, also, are fewer in number.

For popular purposes, the family may be divided into three groups, the *Musteline* (Weasels, Martens, etc.), the *Meline* (Badgers and Skunks) and the *Lutrine* (Otters).



[Jas. A. Speed.]

STOAT (*Mustela erminea*).

This animal is shown in its summer coat. In the north it always turns white in winter. Its winter coat is known as "Ermine."

In the *Musteline* Group, the shortening of the jaws and numerical reduction of the teeth reach the extreme in the family, apart from the Otters. The teeth are adapted to carnivorous habits, and the feet for active movement, being semidigitigrade, with short, curved, sharp claws.

The Stoat, Weasel and Polecat (*Mustela*) are typical examples of this section and are members of the British fauna. Apart from size and colour, they are much alike in appearance and habits. The jaws are short, the body long and slender and the feet hairy between

the pads. They are predacious, blood-thirsty, active creatures, feeding upon any animals they can kill. Although able to climb, they habitually live and hunt on the ground. The young, usually five or six in number, are born in the spring or early summer in a burrow or any secluded retreat.

Weasel (*Mustela nivalis*). This is one of the smallest of the Carnivora, and found all over Great Britain but not in Ireland. It is brown in colour, with more or less white on the middle of the belly and has a short tail, about two inches long, the head and body measuring six or seven inches.

WEASEL—STOAT



FERRET OR ALBINO POLECAT.

The tame Ferret was probably derived from a North African species of Polecat.

[W. S. Berridge.

gether. It is widely distributed in Europe, and in the north regularly turns white in winter; but this change is very rare in Great Britain.

Stoat (*M. erminea*). This is considerably larger than the Weasel, the head and body measuring about eleven inches and the tail five, the tail being black at the end. Otherwise, the colour of the two



WEASEL (*Mustela nivalis*).

The Weasel is one of the smallest of the Carnivora and is found all over Great Britain, but not in Ireland.

[W. S. Berridge.



THE GRISON, A SOUTH AMERICAN REPRESENTATIVE OF THE POLECAT.

[F. W. Bond.

It is common in hedgerows and about farms, where it is a danger to chickens. It feeds, however, mainly on field-mice and is a useful check on these potential pests, but it fearlessly attacks rats despite their superior size. Family parties sometimes hunt in packs, but usually two at most are seen to-

animals is much the same except that in the Stoat the more abundant white on the belly is sharply defined from the brown of the flanks; but in the Stoat inhabiting Ireland and the Isle of Man this contrast is not so pronounced. The Stoat, which is as common in Great Britain as the Weasel,

MAMMALIA (ORDER CARNIVORA)

is a greater pest, since it kills full-grown game-birds, poultry and hares. Like the weasel, it has a wide distribution in Europe, and in the north always turns white in winter, the tail-tip alone remaining black. It often changes partly or wholly white in England, even as far south as Cornwall. Its winter coat, known as "Ermine," was formerly one of the most valuable furs.

Polecat (*Putorius putorius*). The Polecat is bigger than the Stoat, the head and body measuring about sixteen inches and the tail seven inches. The coat, too, is longer and differently coloured, the legs being blackish and the creamy hair on the back overlain by longer, black or brown-tipped hairs, the head showing a whitish band over the eyes. The species is not found in Ireland, and in Great Britain only lingers in a few wilder parts, a pale variety occurring in Wales. But in Central and South Europe it still holds its own, despite the value of its winter fur, which is known as Fitch or Kolinsky.



THE TAYRA, A SOUTH AMERICAN REPRESENTATIVE OF THE MARTENS.
[W. S. Berridge.]

The scent glands of the Weasel and Stoat are comparatively inoffensive; but the odour of the Polecat is so objectionable that it was formerly known in England as the "Foul-mart." When attacked, it raises the long, blackish hairs of its coat, displaying the creamy-white underfur as a

warning mark of identity.

There are many other species of Weasels, Stoats and Polecats found in Europe, Asia and America. From a North African species of Polecat, the tame ferret was probably originally derived. Another close ally of the Polecat is the Mink (*M. lutreola*), a semi-aquatic species with a valuable fur, found in Europe, Central Asia and North America.

Martens (*Martes*). These are the most elegant of the Weasel family. They are larger than the Stoats and Polecats, without their objectionable odour, have longer muzzles, longer, bushier tails and are both terrestrial and arboreal in habits and sufficiently active in trees to catch even squirrels. They are also less strictly carnivorous, varying their normal animal diet with fruit of various kinds. The young, usually four or five in number, are born in hollow tree-trunks or crannies in rocks. Martens are widely distributed in Europe, Central Asia and North America, up to the limits of tree-growth. Many species are known, but the habits of all are similar. Those that are found far north or at high altitudes yield valuable furs in the winter coat.

MARTENS—GLUTTON

Pine Marten (*Martes martes*). This still lingers in a few wild parts of the British Isles, and ranges from Ireland into Asia. It is brown, with a yellow throat; the head and body measure about one and a half feet and the tail some nine or ten inches.

Beech or Stone Marten (*Martes foina*). This is not a British species, and differs from the Pine Marten, with which it was formerly confused, in its smaller ears, larger foot-pads and usually whiter throat. It does not extend so far north in Europe or Asia; but at high elevations in the Himalayas it produces a valuable fur.

Sable Marten (*M. zibellina*). Of all the Martens this is the most prized by the furriers. It inhabits northern Europe and Asia. It is nearly allied to the Pine Marten, but differs in the quality of its fur and other minor particulars. Of the North American Martens, the most interesting is the Fisher or Pekan (*M. pennanti*), the largest of the group, rivalling an otter in size. It is said to be more than a match for the Raccoon and to feed in certain districts on the Canadian Porcupine, which few mammals care to interfere with (see page 750).

Yellow - throated Marten (*Lamprogale flavigula*). This is akin to the true Martens and inhabits India, China and the Malay Peninsula. It is considerably smaller than the Fisher, but larger than the Pine Marten, and is remarkable for its varied colouring of black, brown and yellow.



[W. S. Berridge.
WOLVERENE OR GLUTTON (*Gulo gulo*).
The Glutton inhabits the northern forested districts of the Northern Hemisphere, and is mainly terrestrial, but sometimes climbs trees in search of food.

Glutton or Wolverine (*Gulo gulo*). The Glutton is unmistakably related to the Martens, although in general appearance more like a small bear with a tail. Its colour is dark brown, with a paler band extending along the sides of the body; the coat is thick and long and the bushy tail is about half the length of the head and body, which may be as much as three feet in length. It inhabits the northern forested districts of the Northern Hemisphere, and is mainly terrestrial, but sometimes climbs trees in search of food. Being comparatively inactive, it catches its prey either by strategy or by digging it from the ground and is said to secure even foxes by this method. Trappers dread its vicinity from its habit of following a line

MAMMALIA (ORDER CARNIVORA)

of traps, skilfully overturning them to eat the bait or devouring the captured animal.

Meline or Badger Group (*Melinae*). Here the jaws are typically larger than in the Weasels, the teeth, as indicated by the enlargement and crushing character of the crowns of the molars, are, as in the Bears, adapted for a more vegetable diet, and the animals themselves are comparatively inactive owing to their heavy build, more plantigrade feet and long digging claws. They are mostly found in the Northern Hemisphere, outside the tropics.

Common Badger (*Meles meles*). This exhibits the characters mentioned



[Charles Reid.]

BADGER (*Meles meles*).

The Badger is essentially nocturnal in habits, lying up by day in deep, often branching burrows, known as "sets."

above in a marked degree. The hair of the upper side is long and coarse and grizzled with black and grey, the legs and underside are black, but the face is white, with a broad black stripe on each side. The tail is only about six inches long, the head and body being some two feet four inches, the height about one foot and the weight up to forty pounds.

It is essentially nocturnal in habits, lying up by day in deep, often branching burrows, known as "sets," which may be occupied by successive generations for long periods and extend far underground. These burrows are kept scrupulously clean and are sometimes shared by foxes. The diet is very varied, consisting of eggs, mice, young rabbits, worms, snails, insects, as well as acorns, roots, bulbs and other vegetable substances. The cubs, usually three or four in number, are born in the spring or summer in a

BADGERS AND SKUNKS



By courtesy of]

[The High Commissioner for Canada.

AMERICAN BADGER (*Taxidea taxus*).

The so-called Badger of North America, though resembling our species in habits, size and somewhat in appearance, is only remotely related to it.

it is not found in America, the so-called Badger (*Taxidea taxus*) of North America, though resembling our species in habits, size and somewhat in appearance, being only remotely related to it.

Skunks (*Conchatus, Mephitis and Spilogale*). These also form a very distinct group, restricted to America, where they range from Canada to Patagonia. But they are tolerably similar to the Badger in habits, being mainly nocturnal and feeding upon smaller mammals, birds even as large as poultry, frogs, insects, etc. They are also like small Badgers in shape, but have long, bushy tails and are always characteristically coloured black or dark brown, relieved by white stripes. They are decorated, indeed, with a very distinctive livery by which they may be at once recognized and are the stock instance in mammals of the phenomenon of "warning coloration," which is associated with some special method of defence in an animal that would otherwise be preyed upon. In the Skunks, as is well known, their method is the discharge from glands beneath the tail of a pungent, volatile, suffocating liquid, insupportably offensive in odour and so enduring that clothes once tainted with it require repeated washings before they can be worn again. It is not

special nursery in the burrow, which the female lines with grass or moss.

Owing to its burrowing and nocturnal habits, the Badger is seldom seen, and is much commoner in Ireland and Great Britain than is usually supposed. It ranges from Western Europe into Asia and is represented by related forms as far east as Japan. But



By courtesy of]

[Carl Hugenbeck's Tierpark, Stellingen.

CANADIAN SKUNKS (*Mephitis mephitis*).

This is as big as a half-grown cat, and has a wide range in North America.

MAMMALIA (ORDER CARNIVORA)



[W. S. Berridge.

LITTLE SKUNK (*Spilogale putorius*).

This inhabits Central America and Texas, and is about the size of a Polecat.

supposed that the carnivorous mammals, like wolves, foxes, lynxes, cougars, and raptorial birds like eagles, have instinctive knowledge of the Skunk's nature, but it has been experimentally proved that dogs, accustomed to killing game, regard the Skunk at first sight as vermin to be as easily and promptly destroyed as a house cat or rabbit. So horrible, however, are

the effects of the attack that the hound thereafter gives all Skunks a wide berth, readily identifying the little beasts by their conspicuous pattern. The Skunks themselves are instinctively well aware of their safety, and fearlessly go about their business in the open, rather courting observation than otherwise, by waving their tails in the air, and turn aside for no living thing they may meet.

There are many different kinds of Skunks, represented by the Canadian Skunk (*Mephitis mephitis*), which is as big as a small cat and has a wide range in North America; the Hog-nosed Skunk (*Conepatus*), which spreads from the southern states of the Union of Patagonia, where it is represented by Humboldt's Skunk (*C. humboldtii*); and the Little Skunk (*Spilogale putorius*) of Central America and Texas, which is about the size of a Polecat.

Ratel or Honey-badger (*Mellivora ratel*). This is like a badger in size and appearance and is commonly so-called in India, but it has hardly a trace of the external ear and the teeth are of the flesh-eating type seen in the weasel group. The colour is usually grey or white above and black below and on the legs. Its range is from India into Africa, south of the Sahara. As may be guessed from its



[F. W. Bond.

RATEL (*Mellivora ratel*).

This has the reputation of being one of the most difficult to kill of all the smaller mammals.

RATEL—ZORILLA

colour, the Ratel is protected, like the skunk, by the foetid discharge from its glands and, like many animals so protected, it is extraordinarily tenacious of life and has the reputation of being one of the most difficult to kill of all the smaller mammals. It is also a desperate and fearless



[Neville Kingston.]

ZORILLA (*Ictonyx*).

This is a skunk-like, African animal which combines to a great extent the characters of the Meline and Musteline groups.

fighter and unusually strong, using both teeth and claws with deadly effect on any enemy that ventures to attack it. In virtue of its thick skin, it is indifferent to the quills of the porcupine and boldly enters the burrow of that animal and kills it. It also eats quantities of honey, being equally indifferent to the stings of wild bees; and since it is known to destroy cobras, its hide is probably impervious to their poison. Nothing, indeed, comes amiss to it in the way of animal food, and its diet is partly vegetarian as well. It lives in burrows, caves, rock-clefts and other sheltered places and, being strictly nocturnal, is seldom seen.

Zorilla (*Ictonyx*). This is another well-known African type, which combines to a great extent the characters of the Meline and Musteline groups. The most familiar species is the Muishond or Cape Polecat (*I. capensis*) of South Africa. It is a beautiful little animal, conspicuously banded black and white, and is of interest on account of its adaptive



[W. S. Berridge.]

LITTLE CLAWLESS OTTER (*Amblonyx*).

This little animal, from India and tropical Asia, has, at most, tiny claws on the fore paws.

resemblance to the skunks in habits and in its warning livery, which is associated with stink glands almost equally nauseating in odour.

Otters (*Lutrinac*).

The Otters may be at once distinguished by their structural characters in adaptation to aquatic life, the hind feet being much larger than the fore feet, and provided with very

MAMMALIA (ORDER CARNIVORA)



[W. S. Berridge.]

COMMON OTTER (*Lutra lutra*).

The range of this species extends from Ireland into eastern Asia and from the Arctic coast to North Africa.

long, fully-webbed digits; the fore feet, also, are usually webbed, and the tail is thick, especially close to the body. The head is flattened, with small eyes and ears and valvular nostrils, and the fur is dense and impervious to water.

Otters are found almost all over the world, except in Australia; but, apart from the

Sea Otter, the species (about fifteen in number) are very similar in habits, appearance and structure, though differing somewhat in size and a few other points.

Common Otter (*Lutra lutra*). This extends from Ireland into eastern Asia and from the Arctic coast to North Africa, and may be selected as an example. The colour is dark brown, the head and body measure about two and a half feet in length, the tail one and three-quarter feet, and the weight is usually from twenty to twenty-five pounds, but sometimes more, the female being smaller. Although perfectly at home in the water, swimming by means of sinuous twists of its long body and tail, or by strokes of its feet, it is tolerably active on land, often covering long distances between stream and stream. The diet is varied, consisting of fish, crayfish, mussels, water-rats, water-fowl, occasionally poultry and rabbits, if procurable, varied with insects and a taste of vegetable food. For fishing purposes, the animal frequently enters the sea. The "holt," as the den is called, is either a burrow, a rock crevice or a hollow beneath a tree root, usually near the water, and in this, on a bed of rushes, the young, usually two or three in number, are born blind and helpless in winter. The "dog" Otter stays with the "bitch" until the young are nearly independent and then family parties may be seen fishing and sporting in the water together.

Of the several species inhabiting India and tropical Asia, one of the most interesting is the Little Clawless Otter (*Amblonyx*). This has, at most, tiny claws on the fore paws, which are exceedingly sensitive and used for feeling for fish or crabs lurking under stones at the bottom of streams. A similar variation is met with in one or two African species. In America there are a few species, the Canadian Otter (*L. canadensis*) being closely allied to ours, whereas the large Brazilian Otter (*Pteronura brasiliensis*), the largest of the group, has the tail keeled for swift swimming.

RACCOONS AND KINKAJOUS

Sea Otter (*Lutra lutris*). This, with its heavily-built body, short neck and tail and huge hind feet, in which the toes increase in length from the first to the fifth, is a very different-looking animal from the freshwater species, although its colour is much the same. The tail is barely one foot long and about one-fourth the length of the head and body. The weight is seventy pounds or more. Although formerly abundant on the North Pacific coasts, it has been almost exterminated for the sake of its fur, which is of rare quality and highly prized. It is a slow swimmer and fetches its food, which consists mostly of shell-fish and crabs, from the bottom. For crushing the hard shells of its prey, its teeth are broad, with low, rounded cusps. When feeding, it holds its food in its fore paws, frequently lying on its back at the surface, and it has been seen to nurse its cub, of which there is seldom more than one, in this attitude.

Raccoons and Kinkajous (Family *Procyonidae*)

This family is mainly distinguished from the Mustelidae by possessing two or more cheek-teeth on each side and by the presence of a groove between the main cusps of the upper "caninial tooth," the absence of which is characteristic of the Mustelidae. The number of genera and species is comparatively small, but the genera are as diversified structurally as those of the Mustelidae. They are found only in America.

Common North American Raccoon (*Procyon lotor*). This is about the size of a large cat, has a short, thick-set body, a short, broad head with a pointed muzzle, and a tail only about half as long as the head and body. The fur is long, thick and grey. The face has a broad black stripe below the eyes, with a white stripe above them and white on the muzzle, and the tail is ringed. The feet have the toes free from webbing, the fore feet being exceedingly delicate organs of touch and used for the finding and holding of food. It is the Raccoon's habit of dipping its food in water before eating it that suggested the scientific name "*lotor*," the washer, for the animal. Its diet is omnivorous, consisting of small mammals, birds, reptiles, frogs, fish, crabs, crayfish, insects, fruits, berries, and the like. It hunts



COMMON RACCOON (*Procyon lotor*).
The Raccoon's habit of dipping its food in water before eating it suggested the scientific name "*lotor*" the washer.
[Alston Photo. Finishing Co.]

MAMMALIA (ORDER CARNIVORA)



[F. W. Bond.]
WHITE-NOSED COATIMUNDI (*Nasua narica*).
Coatis are found in Central and the warmer parts of South America.

on the ground by night, but spends the day mostly in trees. It also breeds in trees, making a rough nest for its young, which, four or five in number, are born in the spring. In colder districts of America, raccoons hibernate. An allied species, the Crab-eating Raccoon (*P. cancrivora*), is found in South America.

Coatis (*Nasua*). These are something like raccoons, but have exceedingly long, pig-like probing snouts, very long tails and the toes of the feet webbed and armed with long digging claws. Their diet is as varied as that of the raccoons and, being good climbers, they search for food both on the ground and in trees, a dozen or more sometimes hunting together. They are found in Central and the warmer parts of South America, and there are several different kinds; the best known being the Ring-tailed Coati (*N. nasua*), which has the tail banded and the snout dark, and is not uncommonly red in colour; and the White-nosed Coati (*N. narica*), which has the tail unbanded and the snout white.

Kinkajou (*Potos flavus*). This is a very different-looking animal from the preceding. The head is short and rounded, the tail very long and prehensile and the feet are armed with short, sharp claws for climbing. The colour is yellowish-brown, the fur is shortish, but soft and almost woolly, and the tongue is very long and extensile. The Kinkajou inhabits Central and South America and is almost exclusively arboreal, lying up in holes in trees and feeding by night on any small animals it can catch and on fruits of all kinds as well as honey. The Kinkajou shares with the binturong (page 764) the distinction of being the only carnivorous mammals with a prehensile tail.

False Kinkajou (*Bassaricyon alleni* and others). This superficially so closely



[W. S. Berridge.]
KINKAJOU (*Potos flavus*).
This animal feeds by night on small animals, fruits of all kinds and honey.

PANDAS (FAMILY AILURIDAE)

resembles the true Kinkajou as to be often mistaken for it. The habits, too, are similar; but the tail is not prehensile and there are many other anatomical differences. It is found in Central and South America.

Cacomistles (*Bassariscus*). These differ from the other members of this family in having the teeth more sharply cusped and adapted to the more predatory habits of the animals, which superficially closely resemble the genets, except that the fur is unspotted. Like the raccoons, they are



By courtesy of]

[Richard T. Doonor, Philadelphia, and the Academy of Natural Sciences of Philadelphia, U.S.A. (founded 1812).

GIANT PANDA (*Ailuropoda melanoleuca*).

This is related to the true Panda, but resembles the bears, particularly in size and appearance.

partly terrestrial and partly arboreal, the young, from four to six in number, being born in holes in trees.

Pandas (Family Ailuridae)

The Panda or Cat Bear (*Ailurus fulgens*), although sometimes classified with the raccoons, differs in so many important anatomical characters that it is now referred to a separate family. It is about the size of a raccoon, but has the body longer, and the head shorter and rounder; the legs are more robust, with the paws hairy beneath and armed with sharp, partly retractile claws; the tail is much longer. The colour is very

MAMMALIA (ORDER CARNIVORA)

dark red above, black below and on the legs, with the whitish face striped on each side with red and the tail ringed. The head and body measure about two feet in length and the tail one and a half feet. Unlike the true raccoons, which are American, the Panda is found in south China and the north-eastern Himalayas. Its broad, flat-crowned teeth are adapted to a vegetable diet of bamboo-shoots, roots and fruits of various kinds. Although slow and awkward on the ground, the Panda is a good climber and spends most of its time in trees, the female making use of a hollow trunk as a home for her two cubs.

Giant Panda (*Ailuropoda melanoleuca*). This is related to the true Panda, but resembles the bears, with which it was formerly classified,



[F. W. Bond.

PANDA OR CAT BEAR (*Ailurus fulgens*).

The Panda, a native of south China and the north-eastern Himalayas, spends most of its time in trees.

in some respects, particularly in size and appearance. It is sometimes called the Parti-coloured Bear on account of its singular colouring, the head and body being white, with a black patch over each eye, black ears and legs and a stripe of the same colour on the shoulder. It is exactly like a bear in shape, with a very short tail and broad, flat feet. It inhabits the dense bamboo forests of China; but although nothing seems to have been recorded of its habits, there is no

doubt from the massiveness of its jaws and its large, flat-crowned grinding teeth, that it feeds upon tough vegetable substances, probably on sugar-canes.

BEARS (Family *Ursidae*)

The Bears (*Ursidae*) may be distinguished from all other Carnivora, except the Giant Panda, by their large size and heavy build, associated with a very short tail, loose, protrusible lips, and broad, short, nearly plantigrade feet, provided with five short toes, all close together and with long, strong claws. Their dentition is remarkable for the uselessness of the front cheek-teeth and the large size of the remaining four, which have flat crushing crowns without trace of the cutting blades marking the "carnassial" teeth characteristic of the Order.

Bears, although represented by a comparatively small number of species,

BEARS (FAMILY URSIDAE)



SYRIAN BROWN BEAR (*Ursus arctos syriacus*).
In districts where the cold of winter is excessive, both sexes of Brown Bears hibernate after fattening themselves upon beechmast, acorns and nuts in the autumn.

were found all over Europe and Asia, as far to the south-east as Borneo, only in Morocco in Africa, all over North America, and in the northern parts of South America. They are mainly vegetarian in diet and breed only once a year, but although some of them are the largest of land carnivora, their cubs, seldom more than three to the litter, are remarkably small.

Brown Bear (*Ursus arctos*). This is the species most commonly exhibited in this country. The colour as indicated by the name is typically some shade of brown, but varies considerably, the hair, which is thick and long and forms a mat on the shoulder, is usually dark brown near the skin but paler, sometimes buff, red or even grey at the tips; the legs are darker than the body and head. The size, too, is very variable individually and locally, females being smaller than males. In Europe, where the animal is now very rare, although still lingering in forested districts, a good-sized male stands about three and a half feet at the shoulder. But the species extends from Europe into Asia and North America, where it is represented by many local races, some smaller, some larger than the European bear, the largest of all being found in Alaska.

The Syrian race (*U. a. syriacus*) is paler fawn in colour than the European; the Himalayan race (*U. a. isabellinus*), not uncommon in Kashmir, where it is known as the "Snow



Photos]

RED BEAR (*Ursus arctos isabellinus*).
This is the Himalayan race of the Brown Bear. It is a little smaller and sometimes reddish-brown.

[W. S. Berridge.

MAMMALIA (ORDER CARNIVORA)

Bear " or " Red Bear," is a little smaller than the European and sometimes reddish, brown or silvery. Another kind, the Hoary or Frosted Bear, inhabiting Tibet and central Asia, has the coat black, with silver or red tips and a broad, white collar over the neck. But the most imposing of all are the Alaskan Brown Bears, which stand four and a half feet at the shoulder and measure eight or nine feet long, rivalling the Polar Bear in dimensions.

In habits these Bears are very similar. In districts where the cold of winter is excessive, both sexes hibernate after fattening themselves upon beechmast, acorns and nuts in the autumn. During spring and summer, they eat grasses, roots and other vegetable food, varied with fish, insects and any ground animals like mice, which they can catch; and in settled districts they raid farmyards after pigs, cattle and other livestock.

These depredations and the value of their hides are the main causes of their scarcity in places where they were formerly plentiful. They seldom attack man, except in self-defence; but are formidable foes when cornered, biting savagely and dealing deadly blows with their forepaws. " Bruin's hug," however, is a myth. As is well known, they are skilful but slow climbers, ascending trunks of trees by gripping the bark with their strong, curved claws. The young are born in the winter-quarters of the mother, often under the snow, and have been found in north Europe as early as January, when the outside temperature was over 80° below zero.

Grizzly Bear (*U. a. horribilis*). This Bear of the Rockies and Barren grounds of North America, is so nearly related to the Brown Bear, which it resembles very closely in size, appearance and habits, that it is needless to describe it in detail. Greatly exaggerated stories of its ferocity have



By courtesy of]

[Canadian Pacific Railway.

AMERICAN BLACK BEAR (*Ursus americanus*).

This bear was formerly found almost everywhere in North America, from Canada to the Gulf of Mexico.

BEARS (FAMILY URSIDAE)



By courtesy of]

[Carl Hagenbeck's Tierpark, Stellingen.

POLAR BEAR (*Thalarctos maritimus*).

In this Bear the soles of the feet are much more overgrown with hair than in other species ; a safeguard against slipping on the ice.

been told ; but there seems to be no reason to doubt the accounts of its ability to knock down a bison with a blow of its paw or to drag away the carcase of a wapiti weighing a thousand pounds.

American Black Bear (*Ursus americanus*). This is a smaller kind than the foregoing, standing only about two and a half feet, or a little more, at the shoulder. The colour is typically black, with the muzzle brown, but it varies to cinnamon, slate-grey, or even dirty white, bears of the last-mentioned tint being like little Polar Bears. It was formerly found almost everywhere in North America, from Canada to the Gulf of Mexico. Its habits do not seem to differ in any important particulars from those of the Brown Bear.

Polar or White Bear (*Thalarctos maritimus*). This bear differs from the Brown, Grizzly and Black Bear group (*Ursus*) in having smaller grinding teeth, larger canines and incisors, the soles of the feet much more overgrown with hair, and in its white colour. All these characters are adaptations to life in the Arctic Regions. Its white colour prevents the loss of internal heat and aids the successful stalking of seals in the snow ; the hairs on the feet keep them warm and are a safeguard against slipping on the ice and the teeth are better fitted for killing living prey such as seals and walruses, and for tearing the flesh of stranded whales. These mammals are the diet it is partial to, but it also eats fish and seaweed and in summer, grass and lichens. It is the nature of its habitat near the shores of the Arctic Ocean in Europe, Asia and America, where vegetable food is only obtainable in small quantities in summer, that has driven this bear to be mainly carnivorous. Although a capital swimmer, the Polar Bear is unable to overtake seals in the water ; but he catches them either by a swift pounce when they rise to the surface of their blow holes to breathe or

MAMMALIA (ORDER CARNIVORA)



[W. S. Berridge.

POLAR BEARS AT PLAY.
The Polar Bear is a capital swimmer.

by stealthily stalking them when lying on the edges of the ice-floes. The testimony of Arctic travellers regarding the hibernation of this bear is contradictory. In certain districts males and half-grown young have been observed abroad in mid-winter. In others no bears are to be seen at that period; but whether their disappearance is due to

migration urging them to follow the southward advance of the ice, to be as near as possible to open water where seals are obtainable, has not been ascertained. It is generally agreed, however, that the females retire in autumn to winter-quarters, under the snow, to give birth to their young, but whether they lapse into the state of profound torpidity characteristic of hibernation is not known. The cubs, generally two in number, are small but covered with hair, and are very like the pups of a large dog.

Himalayan Black Bear (*Selenarctos tibetanus*). This Bear differs in many particulars from those described above, notably in the nakedness of the underside of the wrist; the coat, too, is much smoother and shorter and the ears are larger. The colour is black, with the nose tan, and a white, angular stripe on the breast. The height is about two and a half feet in the Himalayas, but less elsewhere. It has a wide range, extending from Persia through the Himalayas to China and Japan, the Japanese (*S. japonicus*) being a small bear, usually about two feet high. Its habits are very similar to those of the Brown Bear; but owing to the structure of the feet, it is a better climber, and has the reputation of



[Charles Reid.

HIMALAYAN BLACK BEAR (*Selenarctos tibetanus*).
This Bear is black, with the nose tan, and a white, angular stripe on the breast.

BEARS (FAMILY URSIDAE)

being a fiercer animal and has been seen to drive a leopard off its kill. In the Himalayas it is found in the forests from the foothills up to about ten thousand feet, or more, in summer ; but even at tolerably high altitudes, it is only a partial hibernator, issuing from its winter-quarters on milder days to feed.

Malayan Bear (*Helarctos malayanus*). This is sometimes called the Honey Bear, and is a little, smooth-coated, short-eared, bandy-legged species, like the Himalayan Bear in its feet, but differing in its more mobile lips, longer extensile tongue and other characters. It ranges from Assam, through the Malay countries to Borneo, and is essentially a forest animal and a very active climber, feeding on fruits and honey, as well as small animals.

Sloth Bear (*Melursus ursinus*). This Bear differs from other species in having closable nostrils, very protrusible lips and tongue, associated with the loss of the two upper median incisor teeth, and the toes united to the tips. It has a long, shaggy coat and is typically black, with a mealy muzzle, although brown specimens now and then occur. Its height is about two and a half feet. It is found throughout



[W. S. Beridge]

SLOTH BEAR (*Melursus ursinus*).

Although mainly frugivorous, this Bear is particularly fond of white ants. It tears the ant hills open with its claws and licks up the insects with its long tongue.

Hindustan, except in the deserts, and in Ceylon, living in forest and jungle and frequently lying up in caves. Although mainly frugivorous, it eats honey and animal food, especially insects, and is particularly fond of white ants, which it obtains by tearing open the ant hills with its claws and puffing the galleries clear of earth before licking the insects with its long tongue or sucking them out by means of deep inhalations.

Spectacled Bear (*Tremarctos ornatus*). This Bear is so-called from the fawn-coloured ring usually encircling the eyes, and is a small species mainly of interest from being an inhabitant of South America, where it is found in the Andes from Ecuador to Chile. Its colour is black, relieved by some white on the muzzle and throat, and its height a little over two feet. Nothing remarkable is known of its habits.

MAMMALIA (ORDER CARNIVORA)

SEALS AND WALRUSES (Pinnipedia or Fin-footed Carnivora)

The Seals and Walruses are distinguished from other Carnivora by the conversion of all the limbs into swimming paddles, the foot being long in comparison with the rest of the limb, which is mostly imbedded in the body. But in all essential points they agree with the bear-like carnivores, of which they are a specialized offshoot. The tail is always short and never used for swimming.

Although typically marine and feeding in the sea, rivers or lakes, the Pinnipeds spend much of their time ashore and always pair and breed on land. The female produces almost invariably only a single pup, which differs from those of the typical, or fissipede, carnivores in being of relatively large size and well-developed at birth, with its eyes open; also in shedding its milk teeth either just before or soon after it is born. The warmer parts of the Indian Ocean are the only seas from which Pinnipeds are absent.

There are three families, the Eared Seals or Sea-lions (*Otariidae*), the Walruses (*Odobenidae*) and the typical Seals (*Phocidae*).

Sea-lions or Eared Seals (Family *Otariidae*)

The Sea-lions (*Otariidae*) have huge flippers and can turn the hind flippers forwards and apply their soles to the ground for locomotion. They are provided with small ears, and swim by means of powerful strokes with their fore flippers. There is a large number of species found in the Pacific and in the southern oceans. They feed mainly on fish and their habits are everywhere very similar.

The different kinds are distinguished by size, the shape of their skulls and the nature of their fur, some of them yielding the valuable "seal-furs" of the trade.

Northern Fur Seal or Sea-bear (*Otaria ursina*). This is the most prized of the fur producers. It was formerly widely distributed in the North Pacific, but now breeds mainly, under strict protection, in the Pribilof Islands. It is of medium size, the males measuring about eight feet long. From November till May or June, these seals keep to the sea, following the fish southwards; but in the early summer they return north, the males being the first to arrive, formerly literally in thousands, and come ashore fighting furiously for space to accommodate the females, which land a few weeks later, each male securing as many as possible for himself. The females give birth to their pups soon after arriving; and the pairing season, in preparation for next year's families, follows. The pups when about two months old, begin to practise swimming with their mothers in November. But after once securing their stations, the males keep to the land, enduring a long fast all through the summer and subsisting the while on the fat accumulated by their fishing activities in the preceding winter.

Southern Fur Seal (*O. pusilla*). Frequenting the coasts of South America, South Africa and Australasia, this Seal is less valuable than the

SEALS AND WALRUSES

Northern Fur Seal and also smaller, the males being about six feet long. Its habits, however, are tolerably similar.

Hair Seals. This is the name given to the species without fur. There are several inhabiting the Pacific and Australian Seas. Of these the best known, from its frequent importation into this country for exhibition is the Californian Sea-lion (*O. californiana*), a medium-sized species



By courtesy of [Carl Hugenbeck's Tierpark, Stellingen.]
CALIFORNIAN SEA-LION (*Otaria californiana*).
This is the best known of the Hair Seals. It is a medium-sized species some seven feet in length.

about seven feet long. Larger still is the Patagonian Sea-lion (*O. byronii*), but the largest of the whole family is the Northern or Steller's Sea-lion (*O. stelleri*), which reaches a length of twelve feet and inhabits the same districts as the Northern Fur Seal.

Walrus (Family *Odobenidae*)

Although the Walrus resembles the sea-lions in the structure and use of the hind feet, it differs in the loss of all trace of external ear, apart from the orifice, its heavy build, and nearly naked, wrinkled skin, but especially



[Gibson & Sons.]
GREY SEAL (*Halichoerus grypus*).
This is the commonest species on the western sea-board of the British Isles.

in the peculiarities of its teeth. The upper canines form a pair of long, stout, downwardly-directed tusks projecting sometimes as much as one and a half feet below the mouth, with six inches or so imbedded in large sockets, greatly expanding the muzzle. They are present in both sexes. The rest of the teeth, however,

MAMMALIA (ORDER CARNIVORA)

are reduced in size and number. Another striking feature is the great length and thickness of the "whiskers."

The Walrus is a huge, ungainly beast, inactive on the land and a slow swimmer as compared with the sea-lions. It is not dependent upon the capture of fishes, being mainly a bottom-feeder, eating clams and other molluscs, which it tears off the rocks or digs from the mud with its tusks. The tusks are also used for hauling the animal up slopes and in rival combats by the males and as weapons in case of attack, for although usually inoffensive, the Walrus fights fiercely if interfered with and has the herd instinct so strongly developed that in the past sailors who hunted them in open boats did so at the risk of being swamped by the combined assault of a dozen or more of these huge beasts. A big male

measures ten feet long and weighs between two and three thousand pounds.

The Walrus is restricted to the coast and ice-floes of the Arctic Ocean and seldom ventures out into the open sea. Specimens, however, have been seen off the coast of northern Scotland and formerly the animal was plentiful in America as far south as Newfoundland. But it has been so persistently slaughtered that its last refuge is now in the extreme north, where, apart from man, its only enemy is the polar bear.

There are two alleged species of Walrus, *Odobenus rosmarus*, inhabiting the North Atlantic,

and *O. obesus*, the North Pacific Ocean.



(Photopress.)

ATLANTIC WALRUS (*Odobenus rosmarus*).
The tusks sometimes project as much as one and a half feet below the mouth.

True Seals (Family *Phocidae*)

The typical Seals are distinguished by the hind limbs being extended backwards and incapable of being turned forwards for locomotion on land, which is effected by spasmodic jerks of the body, aided by the strong claws of the fore feet. Swimming is performed by means of sinuous curves of the hinder part of the body, the broadened flippers playing the part of tail-fin. The external ear is usually represented merely by its valvular orifice.

The two commonest species on the British coasts are the Grey Seal and the Common Seal.

Grey Seal (*Halichoerus grypus*). This has simple, peg-like cheek-teeth

COMMON SEAL (PHOCA VITULINA)

and is comparatively large, the males measuring eight or nine feet long and weighing up to about six hundred pounds.

The colour is very variable, ranging from light grey to black, or a blotched mixture of the two. The species is restricted to the North Atlantic and is the commonest species on our western seaboard,

being partial to rocky coasts. It is mainly a fish-eater and a great enemy to salmon. The pups, born in caves or on the rocks, usually in autumn but sometimes as late as early spring, are covered at first with whitish hair, which is shed some six weeks after birth.

Common Seal (*Phoca vitulina*). This is often confused with the last-named Seal. It has cusped, two-rooted cheek-teeth, and is smaller, the males measuring from four and a half feet to six feet long, and weighing about one hundred and fifty pounds. The colour is typically grey, mottled with black or brown. It is very widely distributed, occurring in the North Pacific as well as the North Atlantic; but it usually shuns rough rock-bound coasts, preferring sand-bank and mud-flat, and is nowhere plentiful in British Seas, except in the north. Its habits are tolerably similar to those of the Grey Seal, but the pups, born in May and June, are not white at birth.



ELEPHANT SEAL OR SEA-ELEPHANT (*Mirounga*).
The males, or "bulls," may attain a length of over twenty feet, and have a remarkably developed and inflatable nasal organ like an elephant's trunk.



Photos by courtesy of

[Carl Hagenbeck's Tierpark, Stellingen.

YOUNG WALRUS.

The Walrus is restricted to the coast and ice-floes of the Arctic Ocean and seldom ventures out into the open sea.

A Seal that sometimes wanders to the shores of Britain is the Greenland or "Harp" Seal, sometimes known as the "Saddleback" (*P. groenlandica*). It takes its name from the two semicircular bands reaching from the shoulders nearly to the tail. Its habitat is the coasts of Greenland and the frozen regions of the Arctic.

MAMMALIA (ORDER CARNIVORA)

A small Seal of the North Atlantic is the Ringed Seal (*Phoca hispida*); measuring between three and four feet in length. The Lake Baikal Seal (*P. sibirica*) is of interest as it would appear to point to this great lake being at one time connected with the oceans.

Another Seal of the Northern Hemisphere is the Monk Seal (*Monachus monachus*), interesting from having the first and fifth toes of the hind foot considerably longer than the rest. It frequents the Mediterranean and neighbouring parts of the Atlantic.

The Bladder-nose or Hooded Seal (*Cystophora cristata*), sometimes known as the Crested Seal, is remarkable because the male has a curious hood of skin over the head and muzzle. This can be blown out when the animal is excited. It is a large, spotted Seal, fiercer than other species, and frequents the coasts of Greenland and the polar regions.



YOUNG CRESTED, HOODED OR BLADDER-NOSE SEAL
(*Cystophora cristata*).

The male has a curious hood of skin over the head and muzzle, and this can be blown out when the animal is excited.

Leopard Seal (*Ogmorhinus leptonyx*). Several species of Seals are restricted to the southern oceans and may be seen in numbers on the Antarctic pack-ice. The largest of these, measuring nearly twelve feet, is the Leopard Seal, so called from its spotted pattern. It feeds mainly on fish and penguins.

Other interesting Seals of the southern oceans are the Crab-eating Seal (*Lobodon carcinophagus*) and Ross's Seal (*Ommatophoca rossi*).

Elephant Seal or Sea-elephant (*Mirounga*). This species takes its name from its gigantic size and the presence in the male of a proboscis about one foot long, which, when expanded with air, gives an indescribably grotesque appearance to the animal. The male measures twenty feet or so in length, but the female, which has no proboscis, is only about nine or ten feet in length. The colour is greyish-brown. The cheek-teeth are small and peg-like in adaptation to a diet of cuttlefish. It was formerly common on the islands of the southern oceans and up the western coast of America as far as California. There are two kinds, the Northern (*M. leonina*), which is the smaller, and the Southern (*M. patagonica*) of the Antarctic and Southern Pacific. Both are now very scarce and rapidly being exterminated for their blubber.

Order CETACEA (Whales, Porpoises and Dolphins)

The Whales have diverged more from the primitive structure-plan than any other order of Mammals; but from the evidence of extinct species, they are believed to be descended from the same primitive ancestral stock as the carnivores. They are completely adapted to aquatic life and, apart from variation in size, are unmistakably alike in general appearance. Their shape is fish-like without any marked division between head, body and



[Herbert G. Ponting.

KILLER WHALES OR GRAMPUS (*Orcinus orca*) RISING TO "BLOW."

This is the only Cetacean that habitually feeds on warm-blooded animals, sea-birds, seals, porpoises, as well as fish.

tail; the tail is provided with a horizontal fin, the "flukes"; all trace of the hind limbs has disappeared, the fore foot is converted into a flipper without visible external sign of digits; and in the head, the ear is represented by its orifice only, the eyes are minute, and the valvular nostrils are situated on the summit of the head, usually far behind the tip of the muzzle; the skin is smooth, hairs only being found in some cases upon the head and muzzle, and underneath the skin there is a layer of oily blubber to give buoyancy to the body and to withstand the extreme cold of polar seas and oceanic depths. Whales swim by means of up and down strokes

MAMMALIA (ORDER CETACEA)

of the powerful tail, the flippers, aided usually by a fin on the back, acting as balancers to preserve the position of the body in the water. They feed upon aquatic animals of all kinds, from seals, birds and fishes to minute marine shrimps, and their classification is based mainly upon the mechanisms for dealing with the particular food they affect.

Food is never masticated, but is swallowed entire, and the popular belief that Whales have a small gullet is only true of those, like the Whalebone Whales, which feed on shrimps, the Cachalot, which takes huge cuttlefish, and the Killer, which swallows seals and porpoises, having capacious throats.

Usually Whales, when undisturbed, rise to the surface to breathe every five or ten minutes; but the large Whales can remain submerged for nearly an hour. On reaching the surface after long submergence, the first act of the Whale is to expel the warm air with a whistling sound, called "blowing." When the water-vapour, with which the expired air is saturated, comes into contact with the cold atmosphere, it is condensed into a column of mist, a dozen or more feet high. This act is called "spouting," because the column of mist was mistaken for sea-water driven from the Whale's mouth through the nostrils.

The period of gestation is believed to be rather less than a year. The young, usually one but occasionally two, are active and capable at birth and about one-fourth or more the length of the mother, who frequently lies on her side in the water to suckle them.

The Whales are divided into two well-defined suborders, the *Mystacoceti*, the Whalebone or Baleen Whales, and the *Odontoceti*, the Toothed Whales.

CLASSIFICATION OF THE ORDER CETACEA

Suborder *Mystacoceti* (*Whalebone or Baleen Whales*)

Right Whales, Fin-back Whales or Rorquals and Hump-backs.

Suborder *Odontoceti* (*Toothed Whales*)

Sperm Whales, Bottle-nose Whale, Narwhal, White Whale, Black-fish, Killer Whale (Grampus), Porpoise, Dolphin, Fresh-water Dolphin.

Whalebone or Baleen Whales (*Mystacoceti*)

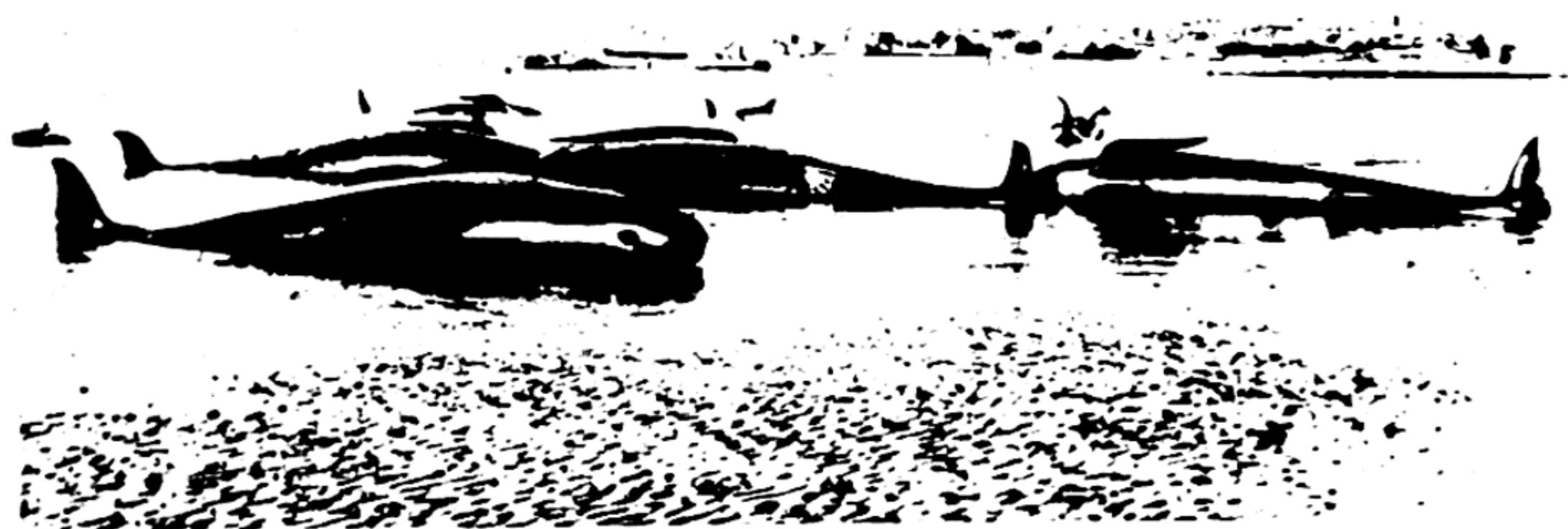
These Whales have no teeth, their place in the upper jaw being taken by two series of closely-packed, horny plates of "baleen" or whalebone, which are broad above, narrowed below, and hang from the roof of the mouth on each side of the huge tongue. Their outer edges are entire, but their inner edges are frayed into horny fibres. They constitute a combined trap and sieve and are entirely subservient to dealing with a diet of small marine organisms swimming in shoals near the surface of the sea. The mechanism operates as follows: taking a mouthful of seawater teeming with these organisms, the Whale shuts its mouth, then by raising its tongue and closing its throat, forces the water between the plates of baleen,

WHALEBONE OR BALEEN WHALES

letting it escape through the lips, sideways, while the tiny animals are caught by the frayed fibres and swallowed when the water is gone. To increase the size of the mouth, the bones of the lower jaw are arched outwards and loosely connected in front. These Whales also have two nostrils or "blow-holes."

The largest known Whales, commonly called Right Whales, Hump-backs and Fin-back Whales or Rorquals, belong to this suborder.

Greenland Whale (*Balaena mysticetus*). This may be taken as typical of the Right Whales. It has an enormous head, the edge of the lower lip elevated and arched, and a cavernous mouth to accommodate the whalebone of which there may be nearly four hundred plates on each side, those in the middle of the mouth being sometimes ten feet long. The prevailing colour is black, often relieved by white on the throat or elsewhere. and the



[W. S. Berridge.]

PILOT WHALES OR BLACK-FISH (*Globiocephalus melas*) **STRANDED.**
These Whales go about in "schools," often of many hundreds, one individual leading the way as a guide or pilot.

total length is fifty or sixty feet. It feeds on oceanic shrimps and molluscs, and is a slow swimmer, seldom exceeding eight miles per hour going at speed. Large specimens will yield two hundred and fifty barrels of oil and three thousand pounds weight of whalebone. This Whale is restricted to the edges of the Arctic ice-floes in the Atlantic and Pacific; but being easily captured and of great value for its oil and whalebone, it has been hunted almost to the verge of extinction.

Atlantic Right Whale (*Eubalaena glacialis*). This was formerly plentiful in the Bay of Biscay and even entered the Mediterranean. It is nearly as large as the last but has a smaller head, a less arched lower lip, smaller baleen and a thicker tail. It has a very wide range and in the south is known as the Southern Right Whale. Like the Greenland Whale, and for similar reasons, it is now rare.

MAMMALIA (ORDER CETACEA)

Pigmy Right Whale (*Neobalaena marginata*). This is found in the southern oceans, and is only about twenty feet in length.

Fin-backs or Rorquals (*Balaenoptera*). These are distinguished by having in the throat a great distensible food-pouch, marked externally, when empty, by a number of parallel grooves and ridges on the throat, by the smaller head, the straight edge of the lower lip, smaller whalebone plates and by a longer body, with a dorsal fin.

There are several species, varying considerably in size, the Lesser Rorqual (*B. acutirostris*) being about thirty feet long, the Common Rorqual (*B. physalus*) about sixty feet, and Sibbald's Rorqual (*B. musculus*), sometimes known as the "Blue Whale," from eighty to a hundred feet. These Whales are found in all seas and feed upon fish, especially herrings and pilchards, as well as marine shrimps. They are swift swimmers, and more dangerous to hunt and much less valuable than Right Whales on account of their smaller yield of oil and whalebone. The whalers, consequently, in former years left them alone. But since the Right Whales became scarce, the whaling industry has turned its attention to the Rorquals, with the result that they are annually decreasing in numbers.

Hump-back Whale (*Megaptera boöps*). This differs from the Rorquals in its shorter, deeper body, hump-like dorsal fin, larger flukes (tail-fin) and much longer flippers, attaining a quarter of the length of the whole animal, which is about forty or fifty feet long. It is found in all seas and, like the Rorquals, now forms an important item in the whaling industry.

Californian Grey Whale (*Rhachianectes glaucus*). This is distinguished from the preceding by having from two to four grooves only on the throat and the head rough with bristles. It reaches a length of about forty feet, and inhabits the North Pacific, but is now very rare.

Toothed Whales (*Odontoceti*)

In these Whales the mouth usually has teeth but never baleen plates, there is a single nostril, and the bones of the lower jaw are straight and firmly united in front.

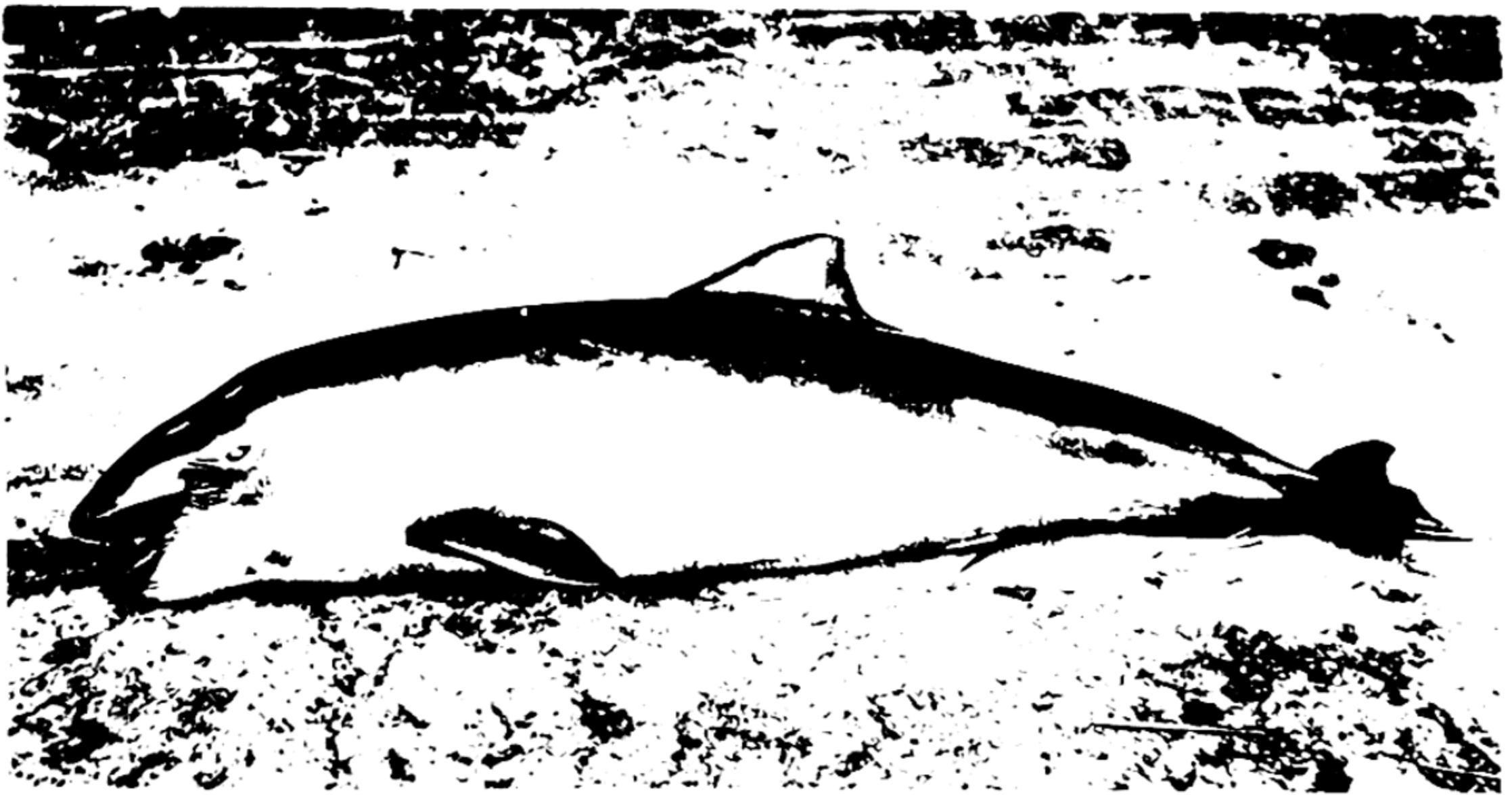
The members of this group are known according to their size as Whales, Porpoises and Dolphins. There is a great number of species, exhibiting a wider range in structural characters and being on the average much smaller than the Whalebone Whales.

Sperm Whale or Cachalot (*Physeter catodon*). This is the largest and most important species. The male may reach a length of sixty feet, whereas the female is only half the length, a sexual discrepancy in size not met with elsewhere amongst mammals. The head in this Whale is of enormous size, about one-fourth of the total length, and this is due to the immense development of the snout, which is bluntly rounded at the end,

SPERM WHALE—BOTTLE-NOSE WHALE

considerably overlaps the lower jaw, and carries the single nostril at the tip of its summit. The upper jaw is toothless, but there are about twenty-four nearly conical teeth on each side of the lower jaw.

This Whale is addicted to the warmer oceans and usually occurs in "schools"; but relentless persecution by whalers, to whom the Cachalot was always a coveted prize on account of its spermaceti-permeated blubber, has made it a rarity. The bulk of this substance is obtained from a basin-shaped reservoir in the head. This Whale also yields an excretory product found floating in the sea, the valuable substance known as ambergris, used in the preparation of perfumes. The Cachalot is the most dangerous of all the Whales. In the old days it sometimes charged and sank small whaling vessels and frequently smashed harpooners' boats to matchwood with a stroke of its flukes. It feeds mainly on large squids and other



PORPOISE (*Phocaena phocaena*).

[W. S. Burridge.]

The Porpoise, usually seen in small schools, is black above, white below and measures between five and six feet in length.

cuttlefish, which it is known to hunt at great depths. But it also takes large fish, like cod, in abundance.

Lesser Sperm Whale (*Kogia breviceps*). This is a small, mainly Antarctic species, measuring about ten feet long and provided with only ten or so teeth on each side of the lower jaw. In many respects it serves to connect the Cachalot with the more typical Toothed Whales.

Bottle-nose Whale (*Hyperoodon rostratus*). This species resembles the Sperm Whales in yielding spermaceti, and in some other respects. It differs, however, in the beak-like projection of its short jaws from the front of the swollen head, in the absence of functional teeth, and in the presence of a pair of grooves on the throat. It measures from twenty

MAMMALIA (ORDER CETACEA)

to thirty feet in length and inhabits the North Atlantic, feeding on cuttlefish.

Narwhal or Sea Unicorn (*Monodon monoceros*). The Narwhal is distinguished from all Cetaceans by the presence in the male of an immense tusk, sometimes nine feet long, projecting like a great spear from the left side of the bluntly-rounded muzzle. This tusk, with its spirally arranged grooves, is the original of the horn of the unicorn of heraldry. Sometimes the right tusk is developed as well; but since in the female neither tusk cuts the gum, it may be inferred that the weapon is of use to the male in rival combats. This small Whale, mottled in colour and about eighteen feet long, lives in Arctic Seas, south of the ice-fields, and having a practically toothless mouth, feeds mainly on cuttlefish, though taking bony fishes as well.

White Whale (*Delphinapterus leucas*). This resembles the Narwhal in size, shape and habitat, but the tusk is absent and there are nine or ten teeth above and below on each side of the mouth.

Black-fish or Pilot Whale (*Globiocephalus melas*). This is also known as the Ca'ing Whale, and resembles the last in the number of its teeth and rounded head, but differs in colour, and in having a dorsal fin. It is about twenty-five feet in length and inhabits temperate and tropical seas, feeding mostly on cuttlefish and going about in "schools," often of many hundreds, one individual leading the way as a guide or pilot.

Killer Whale or Grampus (*Orcinus orca*). This is a well-known species, world-wide in distribution and sometimes seen off the British coasts, where it may be known by its high dorsal fin, black and white colouring and large size. It is a voracious, predatory Whale, with a dozen or so large teeth on each side of the upper and lower jaws, the male measuring between twenty and thirty feet in length, and the female about half that length. It is the only Cetacean that habitually feeds on warm-blooded animals, sea-birds, seals, porpoises, as well as fish. It is a swift swimmer, often hunting in packs. Several have been seen attacking a Greenland Whale, tearing at the lips to get at the tongue of the sluggish, defenceless monster. Its voracity may be gauged by the record of the finding of fourteen seals and thirteen porpoises in the stomach of a single individual measuring twenty-one feet in length.

Common Porpoise (*Phocaena phocaena*). This is the only Cetacean of frequent occurrence in British waters, where it may often be seen, usually in small schools. It is black above, white below and measures between five and six feet. Its head is bluntly rounded and its teeth, of which there are about two dozen above and below on each side, have spade-shaped crowns. It feeds on fish and often ascends tidal rivers in pursuit of them.

Common Dolphin (*Delphinus delphis*). Schools of dolphins, playing around the ship, are a familiar sight to travellers in the Atlantic and Mediterranean.

DOLPHINS



DOLPHINS, PHOTOGRAPHED FROM A SUBMARINE.

[Topical Press.]

It is larger than the Porpoise, measuring between seven and eight feet, and has long, beak-like jaws and twice as many teeth, with simple, pointed crowns.

Several species, called, according to fancy, Porpoises or Dolphins, inhabit the upper waters of large tropical rivers. Many of these are closely related to the marine forms that pass under those names. One of them, the Camerun Dolphin (*Sotalia teuxi*), is of exceptional interest from being, in part, at least, apparently a vegetable feeder, judging from the leaves and grasses that have been found in its stomach. But some of these fresh-water Cetaceans found in India, China and South America are important from exhibiting several skeletal characters showing them to be more primitive types than the other Toothed Whales. The best known is the Susu (*Platanista gangetica*), found in the Brahmapootra, Ganges and Indus. It is eight feet long, and muddy in colour to match the turbid waters it frequents. It is blind and feeds mainly, apparently, on fishes it discovers in the mud at the bottom by probing with its long, slender, beak-like jaws, which are provided with a very large number of teeth. Another kind, the Ting Ling Dolphin (*Lipotes vexillifer*), which has slightly up-curved jaws, lives in the Ting Ling Lake, six hundred miles up the Yang-tse-Kiang River in China.

Order INSECTIVORA

Although obscure and unattractive, the animals of this Order are in several respects interesting. In their lowly organization they are not far from the primitive stock of placental mammals; but they admirably illustrate a phenomenon common in all classes of animals, namely the combination of primitive features with others that have averted extinction. In the struggle for existence they have saved themselves, either by acquiring protective weapons like spines and stink glands, by the adoption of particular habits like living in trees, water, or underground, or by finding their way to parts of the world where predatory foes are few. The adaptation to varied habitats has brought about variations in external characters producing creatures as dissimilar in appearance as otters are from mice.

The teeth, especially the incisors and canines, are extremely varied in number, size and arrangement. A common external feature is a long muzzle ending in a sensitive, probing snout.

The Order Insectivora is divided into two suborders. In the first, the *Lipotyphla*, the brain is less advanced in structure, and the dilatation of the intestine known as the caecum is absent. The *Lipotyphla* include two groups: to the first, distinguished by V-shaped molars, belong the Golden Moles and the Tenrecs; to the second, in which the principal cheek-teeth have broad crowns with W-shaped grinding surfaces, belong the Moles, Shrews, and Hedgehogs. The second suborder, *Menotyphla*, includes the Elephant-shrews and Tree-shrews, distinguished by the presence of a caecum, a higher type of brain, etc.

Suborder LIPOTYPHLA

The first group of the *Lipotyphla* is characterized by narrow molars with a V-shaped crown. It includes the Golden Moles, the Otter-shrew, and the Tenrecs.

Golden Moles, Otter-shrew and the Tenrecs

Golden Moles (Family *Chrysochloridae*). As their popular name indicates, this family is thoroughly adapted to subterranean life. There is no external trace of eyes, ears or tail, the head is conical, with the tip of the snout ending in a patch of naked skin probably used for boring in the soil. The legs are very short, with little more than the feet projecting from the body. The hind feet are not greatly modified, except that the claws, which no doubt aid in digging, are long and stout; but the fore feet are profoundly affected for work underground. The claws of the first, second and third digits progressively increase in size, those of the third being very long, stout and falciform and evidently the chief tool in digging. This foot is entirely different from the corresponding foot of the Common Mole, the superficial resemblance between the animals being a case of adaptation to similar fossorial habits.

MOLES, SHREWS AND TENRECS

The general colour of the Golden Moles is brownish, but the soft fur exhibits under reflected light a beautiful iridescent sheen, which is intensified by immersion in alcohol.

They are found in Central and South Africa and live in extensive burrows just beneath the surface of the soil, feeding upon worms, grubs, beetles and other insects. At the breeding time the female makes a nest of grass for the reception of her young.

There are several species of Golden Moles, the most familiar being the Cape Golden Mole (*Chrysochloris asiatica*), which is common in the western districts of Cape Colony, and measures about four and a half inches in length. A much larger species, the Giant Golden Mole (*Chrysospalax trevelyani*), measuring nine inches long, is found near King William's Town.

Otter-shrew. The family Potamogalidae includes only the Otter-shrew (*Potamogale velox*), an animal modified, as its name suggests, for aquatic life, and very closely resembling superficially a small otter, having a flattish head, short limbs and a powerful tail, as thick at the root as the body and flattened from side to side farther down. As the feet are not webbed, the tail is evidently the sole means of propulsion through the water. The animal is covered with thick brown fur and measures one and a half feet or more in total length, of which the tail is about nine or ten inches. It lives in the tropical forests of Central and West Africa, lurking under rocks in the banks of streams on the look-out for fish, which, on account of the astonishing speed with which it swims, it catches with ease.

The Golden Moles and Otter-shrew are examples of insectivores with V-shaped molars, which have probably survived on account of the adoption of subterranean and aquatic habitats respectively. There remain two families, with similar teeth, which have found refuge in isolated areas of the world.

Tenrecs (Family *Centetidae*). These are almost restricted to Madagascar, one of the homes of primitive types, and are represented by a considerable number of species varying in structure and habits, but although some are burrowers and some aquatic, the resulting modifications are unimportant in comparison with those of the Golden Moles and Otter-shrews.

On account of its large size and occasional exhibition in European menageries, the best-known member of this group is the Tailless Tenrec (*Centetes caudatus*), representing a division of the family in which the back is spiny, very much as in the hedgehogs. In this particular species, however, the spines, although present and arranged in bands in the comparatively defenceless young, almost entirely disappear, except on the neck, in the adult, which, being strongly built, nearly one and a half feet long and provided with long, piercing canine teeth, is more capable of taking care of itself. Its colour is yellowish-brown, and, like most insectivores, it has a long, probing snout used for uprooting worms and insects, the principal items in its diet, to which, no doubt, are added any small vertebrated

MAMMALIA (ORDER INSECTIVORA)

animals it can kill. Its home is mainly in the mountains of Madagascar and it has the habit of lying dormant in burrows from June to December. Even when brought to Europe, it keeps this custom, although supplied with plenty of food. Another peculiarity is its extraordinary fertility, the habitual number of young to the litter being over a dozen, sometimes as many as a score. This animal also occurs in some of the small islands near Madagascar, even in Mauritius and Reunion, where, no doubt, it has been artificially introduced.

Of the other species, distinguished by preserving their spines throughout life, reference need only be made to the Spiny Tenrec (*Ericulus spinosus*), which is as well armed in this respect as hedgehogs and closely resembles them superficially, although the spines are not so stout.

The members of this family, distinguished by their soft fur and the absence of spines, exhibit some interesting variations in habit and structure.

The Rice Tenrecs (*Nesoryctes tetradactyla* and *Oryzoryctes hova*) resemble large shrews, but have the claws of the fore feet enlarged for digging; the colour is olive-brown and the tail short. They are great burrowers, doing considerable damage to rice crops by tunnelling in the roots in search of worms and grubs.

The Marsh Tenrec (*Limnogale mergulus*), on the contrary, is adapted to aquatic life. In size, colour and appearance, except for its long snout, it superficially resembles the water-rat, and its habits, no doubt, are like those of the Water-shrew; but the fully-webbed hind feet suggest superior swimming powers.

Finally, the Mouse Tenrec (*Microgale longicaudata*) has the distinction of possessing relatively the longest tail in the class of mammals. This little creature is reddish-brown in colour and looks like a long-snouted mouse with a prodigious tail. The head and body measure a little over two inches, but the tail may be over five inches. Such tails are only found in jumpers, and since the Mouse Tenrec has long hind feet, it may be inferred that activity has been an important factor in its survival.

The *Solenodontidae* are distant relations of the Otter-shrew and the Tenrecs that have found refuge in the West Indian islands of Cuba and Hayti. The Cuban species (*Solenodon cubanus*) is known to the natives as the Almiqui, and the Haytian (*S. paradoxus*) as the Agouta. The latter was the first to be discovered and received its scientific name from the grooves on the canine-like incisors of the lower jaw and the puzzle its classification presented. They are the sole representatives of the family *Solenodontidae*. In size they equal the Tailless Tenrec of Madagascar, the head and body measuring about one foot in length, but differ from it superficially in the absence of spines, in possessing a long, scaly tail measuring some eight inches, very large claws on the feet, a more pronounced snout and in the position of the teats far back on the groins. The general colour is brownish, varied with darker and lighter tints, the

HEDGEHOGS AND THEIR ALLIES



[W. S. Berridge.]

CUBAN SOLENODON (*Solenodon cubanus*).

Solenodons are distant relatives of the Otter-shrew and Tenrecs that have found refuge in the West Indian islands of Cuba and Hayti.

Cuban Almiqui having the head tawny-yellow, whereas in the Haytian it is much browner. About the habits of these animals, which are rare, very little is known; but the avidity with which captive specimens devour raw meat and the excitement they evince at the sight of live birds, even as large as fowls, suggest

that they subsist on any living creatures they can find and overcome.

The remaining families of the Lipotyphla are distinguished by broader cheek-teeth, often with a W-shaped grinding surface.

Hedgehogs and Their Allies (Family *Erinaceidae*)

These are unknown in America, and have the large cheek-teeth flatter than in the moles and shrews, and without the high, sharp cusps and cutting edges seen in those animals. The Hedgehogs themselves, the most highly-organized members of the family, differ from Moles in many other characters; but in south-eastern Asia there are several insectivores which serve in a measure to link the typical Hedgehogs with the Mole family. For want of an appropriate popular title they may be called the Gymnuras, a name derived from the scientific title of the best-known species, Raffles' *Gymnura* (*Gymnura gymnura*)

This animal differs superficially from the Hedgehogs in having no trace of spines and a long, nearly naked, scaly tail. It is one of the largest of the insectivores, the head and body measuring about one foot in length and the tail about eight inches. It ranges from Malaya to Borneo and is nocturnal, sheltering during the day under the roots of trees and coming out at dusk to



[D. Sisk-Smith.]

TENREC (*Centetes ecaudatus*).

These are hedgehog-like animals almost restricted to Madagascar. There are numerous species.

MAMMALIA (ORDER INSECTIVORA)

hunt for its food, which consists of insects of various kinds. It is very conspicuously coloured, usually a mixture of black and white, the white predominating on the head and forequarters, but some individuals are wholly white, and this conspicuous "warning" colouring, as in the case of the Indian "Musk Rat," described on page 833, is accompanied by a most unpleasant odour, said to resemble stale Irish stew, due to the secretion emitted by two glands, situated, not on the flanks as in the shrews, but beneath the tail.

There are several related but smaller genera and species, found in Burma, China and the Philippines, distinguished by variations in the number and structure of their teeth and other characters.

Typical Hedgehogs. These may be known at once by the shield of sharp, erectile, usually black and white spines which protects the back and the top of the head; the face, limbs and underside being hairy. Although widely distributed and differentiated by their teeth, feet and other characters into a large number of genera and species, they are superficially very much alike, all tolerably closely resembling the typical European Hedgehog (*Erinaceus europaeus*).

The general appearance of this animal, with its heavily-built body, short tail and legs and pointed snout, is well known. Equally familiar is its power of rolling into a spiny ball when alarmed, with its limbs, head, tail and other vulnerable parts tucked out of harm's way. In habits it is nocturnal and very varied in its tastes, eating almost any animal substance, alive or dead, it can find, from carrion, insects, slugs, worms and the like to eggs and even fowls. It also kills rats and adders and the long-discredited stories of its sucking cows sleeping in the meadows at night have recently turned out to be true. The Hedgehog spends the day curled up asleep under dead leaves or low herbage; but for its winter sleep, which lasts from late autumn till spring, with occasional periods of activity during exceptionally mild spells, it seeks a more secluded place, underground if possible, lining the retreat with grass, moss, etc. In a similar nest the young are born in the summer. The litter usually consists of four; but although blind and helpless, the young are born with spines, which, soft at first, soon harden. The average length of the male is about ten inches.

This species, which is common in Ireland and Great Britain, is one of the largest of the Hedgehogs, being equalled, perhaps surpassed slightly, only by the Afghan Hedgehog (*E. megalotis*). No important difference in habits has been recorded between the species, although they range from Ireland to Central Asia and the south of India, and from Sweden to the Cape of Good Hope. It is only, however, in latitudes where winters are severe that hibernation takes place.

Moles (Family *Talpidae*)

The Moles and their allies have sharp-cusped cheek-teeth, but never

MOLES (FAMILY TALPIDAE)

have the front teeth modified as in the shrews, although otherwise these teeth are variable. The typical Moles are adapted for underground life, but some members of the family are aquatic.

Old-world Moles. The Common Mole (*Talpa europaea*), like other European species, has the most primitive dentition of all the insectivora,

the six incisors above and below being small and subequal and the upper canine, tusk-like. But the shoulder bones and fore limbs are highly specialized for digging; the head, with its long snout, tiny eyes and obsolete ears, being thrust back between the shoulders and the fore feet, with five long, powerful claws, widened by a big bone arising from the wrist. For the rest, the body is cylindrical and covered with close, erect fur; the hind limbs are unmodified and the tail is short. The ordinary colour is glossy blackish-grey, but fawn is a not uncommon variation. The head and body are usually five and a half inches in length and the tail about one inch long. Although not found in Ireland, this Mole is common throughout Great Britain, whence it extends into temperate Europe. Related species are found in Spain, Italy and eastward in Europe and Asia as far as Japan and Burma.



COMMON EUROPEAN HEDGEHOG (*Erinaceus europaeus*).
This hedgehog eats almost any animal substance, alive or dead, from carrion, insects, slugs, worms and the like to eggs, and even fowls.



Photos [W. S. Bridge]
LONG-EARED HEDGEHOG (*Hemiechinus megalotis*).
This is a large eared Indian species.

The Mole spends most of its time underground, where, on account of the rapidity with which it can dig, it is safe from enemies, but it occasionally comes to the surface, where the slowness of its movements renders it an easy prey to foxes, weasels, owls and other predatory animals.

Formerly it was supposed that the Moles' burrows were excavated in accordance with a definite, symmetrical plan.

MAMMALIA (ORDER INSECTIVORA)

the construction being called the "fortress." But it is now known that they are driven in almost any direction through the soil, by the animal searching for earthworms and grubs, on which it principally feeds. The so-called "mole-hills," so familiar in the countryside and such a nuisance in private grounds to croquet and lawn-tennis players, are heaps of earth cast out, usually over the site of the nesting chamber. In this the young, naked, blind and usually three or four in number, are born on a bedding of leaves and grass in the spring.

North American Moles. These differ from those of the Old World in having the front upper incisors tusk-like; but their habits are similar. There are several different kinds, two being especially interesting. The Web-footed Mole (*Scalops aquaticus*) is distinguished by its webbed hind feet, which inspired the mistaken idea that the animal is aquatic. No doubt, the webs are useful for kicking back loosened earth in the burrows. The Star-nosed Mole (*Condylura cristata*) has the tail nearly as long as the body, but its chief peculiarity lies in the tip of the snout being provided with a number of radiating tactile filaments.

In their dentition the American Moles approach another section of the

family, the Desmans and their allies, which are not specialized diggers and have the fore feet normal in size and structure and smaller than the hind feet.

Desmans. The most familiar of these are two European species, the Spanish Desman (*Galemys pyrenaica*) and the Russian Desman (*Desmana moschata*), found in the countries from which they are named. They are thoroughly adapted to aquatic life, swimming by means of their long thick tails and enlarged, paddle-like hind feet, which have a fringe of stiff hair along the outer edge and the digits fully webbed. The snout also is peculiar, being very long, flattened, expanded at the tip and highly flexible. They live in deep burrows in the



[Stanley Crook.

COMMON MOLE (*Talpa europaea*).

Although not found in Ireland, the Mole is common throughout Great Britain.

DESMANS



MODEL OF A MOLE HILL AT THE NATURAL HISTORY MUSEUM, LONDON. (W. F. Taylor.)
Formerly it was supposed that the Mole's burrows were excavated in accordance with a definite symmetrical plan. But it is now known that they are driven in almost any direction through the soil, by the animal searching for earthworms.

banks of streams, but spend most of their time in the water, hunting for the insects, worms, molluscs and fish on which they feed. The Russian Desman, the larger of the two, the head and body measuring about ten inches and the tail, which is flattened from side to side for the greater part of its length, six inches, has been compared to an otter in swimming powers; but the Spanish Desman, with a total length of ten inches, of which the tail, flattened only towards the end, is half, has been authoritatively described as inferior in aquatic agility to the Water-rat or Water-shrew, despite its profound structural adaptations to life in water; and this inferiority was ascribed to the handicap of its descent from inactive fossorial ancestors of the Mole stock.

MAMMALIA (ORDER INSECTIVORA)

Shrews (Family *Soricidae*)

The Shrews are especially distinguished by the large size of their central front teeth, those of the upper jaw being hook-like and armed with a supplementary fang, and those of the lower jaw exceedingly long and projecting straight forwards. A few of the species are modified for aquatic life, but the majority are exclusively terrestrial in habits, mostly nocturnal, insectivorous animals with long, sensitive snouts, small eyes and soft fur, usually with a well-developed tail and unmodified feet. Their average size is much less than that of the other families, the largest having only the dimensions of a small rat and the smallest being the tiniest of all mammals. Judging, nevertheless, from their wide distribution and number of species, they have been the most successful of all the insectivora in the struggle for life. They are found in temperate and tropical parts of Europe, Asia and Africa, in North America and as far south in the New World as the northern parts of South America, but not in Madagascar or Australia.

Four species of the family are found in the British Isles. These may be dealt with, first.

Typical Shrews (*Sorex*). Of these the Common British Shrew or Shrew-mouse (*Sorex araneus*) is a familiar example. It is distinguished by having the tips of the teeth brown, by the uniform coating of short hairs on the tail and by their structural adaptation to terrestrial life. This species, which resembles a small, long-nosed mouse, is darker or lighter brown above and greyish below, the length of the head and body being between two and a half and three inches and of the tail about one and a half inches. It is common everywhere in the countryside of Great Britain; and its food is mainly insects, worms, snails and the like. Its appetite is prodigious, a specimen has been known to eat at a meal five snails, each almost as large as itself. It spends its time eating and sleeping, always falling asleep after a meal. If deprived of food for a few hours, it invariably dies, and the necessity for constant feeding keeps it active day and night. It does not, however, hibernate. Sometimes it digs burrows for itself, but more frequently adopts those of field-mice. The female, however, commonly makes a nest for her young amongst thick grass or herbage. The breeding season lasts throughout the summer, the average number of young to the litter being half-a-dozen; but there are probably three or four broods in the year. The span of its life is little more than a year. Its chief enemies are owls, kestrels and other predacious birds; but although cats will kill it, they will not eat it, on account of the odour the little animal emits from a scent gland on the flanks.

The Pigmy-shrew (*Sorex minutus*) is smaller than the Common Shrew, the head and body measuring only a little over two inches. It is the only Shrew found in Ireland. Although not plentiful, it is widely distributed in Great Britain, whence, like the Common Shrew, it spreads eastwards to Central Asia.

SHREWS (FAMILY SORICIDAE)

The Water-shrew (*Neomys fodiens*), another British species, is about half-an-inch longer than the Common Shrew, blackish-grey in tint above and, in adaptation to swimming, has the feet fringed with stiff hairs and a crest of similar hairs on the underside of the tail. Although perfectly adapted for

water life and feeding mainly upon aquatic insects, snails, worms, small fish and the like, this Shrew is almost equally active on land, and may frequently be found in hedges or other places remote from streams. But it habitually makes its home near water, digging deep burrows in the banks of streams, and in these the females construct nests of grass or moss for their young, which, half-a-dozen or so in number and blind and naked, are born in early summer, a second litter probably being produced later in the year.

Brown-toothed Shrews are widely distributed in Europe and Asia and even in America, the commonest Shrew of America being known as *Blarina*. It extends as far south as Venezuela.

The last British species, Blair's Shrew (*Crocidura cassiteridum*), which is about the size of the Pigny-shrew and restricted to the Scilly Isles, belongs to a group called from the colour of the teeth, the "White-toothed" Shrews. Of these there are many different kinds, widely distributed in Central Europe, Asia and Africa. They contain both the largest and



[Photos]

[W. S. Berridge.]

WATER-SHREW (*Neomys fodiens*).

In adaptation to swimming, this Shrew has the feet fringed with stiff hairs and a crest of similar hairs on the underside of the tail.

N.H.

GGG



COMMON SHREW OR SHREW MOUSE (*Sorex araneus*).

If deprived of food for a few hours, this Shrew invariably dies, and the necessity for constant feeding keeps it active day and night.

smallest members of the family. The Etruscan Shrew (*Suncus etruscus*), for instance, is a tiny species, the head and body measuring only one and a half inches, the smallest mammal known. One of the biggest, on the other hand, is the familiar Indian "Musk Rat" (*S. caeruleus*), which is typically bluish-grey in colour, with the head and body six inches and the tail three to four inches long. This species is a good illustration of the phenomenon of protective

MAMMALIA (ORDER INSECTIVORA)



[D. Seth-Smith.]

TONKIN TREE-SHREW (Family *Tupaiidae*).

These animals, with their size and appearance and long, hairy tails, could readily be mistaken for squirrels but for their long snouts and slender, but not prehensile, thumbs.

advertisement, of which there are many instances in mammals.

It is a fearless little creature, invading houses after dark in search of food, and constantly squeaks as it noisily shuffles about, its pallid colouring making it look as if smeared with luminous paint, so that it is conspicuous in the dim light. Unmolested, it is inoffensive; but when alarmed it gives off an intolerable smell of musk that adheres to everything the secretion from the gland on the flank touches. Many dogs, though eager to kill these Shrews, either resolutely refuse to touch

them or, if they yield to the temptation, show unmistakable signs of disgust at the consequences.

Owing to their likeness to the rats which frequent the same houses in India, it is clear that the Shrews might easily be mistaken for those vermin and killed at sight by a dog or cat. Hence it is to their advantage to be as conspicuous and noisy and odorous as they can, so that a carnivore which has once experienced the unpleasantness of interference with one may recognize the next as something wisely left alone.

Some of the White-toothed Shrews are adapted to aquatic life. One of these, the Himalayan Water-shrew (*Chimarrogale himalayica*) closely resembles in habits and structural modifications the European species; the other, the Tibetan Water-shrew (*Nectogale elegans*), is, on the contrary, much more modified and is like a diminutive Desman (page 830).

Another oriental species, the Short-tailed Shrew (*Anurosorex assamensis*) is evidently a specialized burrower, judging by its resemblance to the moles in its short legs and tail, tiny eyes, and obsolete ears. It occurs in Assam, and there is a related species in Tibet.

Suborder MENOTYPHLA

Tree-shrews or Tupaias (Family *Tupaiidae*)

These hold the highest place in the Order on account of superiority in the size of the brain, a better-developed cranium, and an annular orbit with large diurnal eyes. The hip-bones (pelvis) also form a long and complete union below, which is never the case in the lower types of the Order. The Menotyphla are sometimes regarded as a distinct Order of mammals.

The Tree-shrews in size and appearance, with their long, hairy tails,

TREE-SHREWS—ELEPHANT-SHREWS

diurnal habits and general activity, recall squirrels and could readily be mistaken for them but for their long snouts and slender, but not prehensile, thumbs. They are not, however, so agile as squirrels and, although some live in the tree-tops, they may mostly be seen running about in the forest amongst the roots of trees, hunting for insects and other small prey, which, varied with fruits, constitute their diet. Like all insectivora, they are quarrelsome amongst themselves and live in pairs or singly. The female is said to produce only one young one at a time.

The family ranges from India throughout the Malayan Islands, and is represented by many different kinds closely resembling each other in habits and general appearance, the best known being Elliot's Tree-shrew (*Anathana ellioti*), a rather pale, speckled species from southern India and Belanger's Tree-shrew (*Tupaia belangeri*), a browner species, common in Burma and Malaya. A much rarer kind is the Pen-tailed Tree-shrew (*Ptilocercus lowi*), from Borneo, distinguished by the feather-like arrangement of the hairs at the end of the tail, the rest being short-haired.

Elephant-shrews or Jumping-shrews (Family *Macroscelididae*)

Although related to the Tree-shrews, the Elephant-shrews are specially adapted for swift movements over open or rocky country, which when going at speed they traverse by a series of hops, their hind legs being greatly lengthened for the purpose. They are lively little animals, with large eyes, soft fur, dumpy bodies, the tail, as in all hopping mammals, being long; but the cylindrical, narrow snout, like india-rubber in flexibility, gives them a very quaint appearance.

They inhabit Africa, from Algeria to Cape Colony; and in habits are diurnal and insectivorous, living in burrows in sandy or rocky districts, especially where scrub affords shelter. There are many different kinds, the Saharan (*Elephantulus deserti*), a sandy-grey species, common in Algeria, and the Common Elephant-shrew (*Macroscelides proboscideus*), a redder species from the Cape flats, representing smallish examples with the head and body four or five inches long and the tail rather less. Nearly twice as large as these is the Four-toed Elephant-shrew (*Petrodromus tetradactylus*), which is darker in tint and inhabits East Africa.



ROCK ELEPHANT-SHREW (*Elephantulus rupestris*).
Their hind legs being greatly lengthened, these little animals can traverse open or rocky country at speed by a series of hops.

Order CHIROPTERA (Bats)

The Bats are distinguished from all other mammals by the conversion of the fore limbs into wings capable of sustained and rapid flight; and there are good reasons for thinking they were evolved from some arboreal insectivora which, like the Colugo (p. 842), planed from tree to tree by means of a well-developed patagium or wing-membrane. But the superiority of the bat's wing depends upon the extension of the patagium between all the digits of the fore foot, except the pollex, which is omitted to serve, with its sharp claw, as a climbing organ; the digits concerned, as well as the other bones of the limb, being enormously elongated to give expanse to the membrane. The hind feet, which are not involved in the flight membrane, are of normal size and have five subequal digits armed with hooked claws by means of which the animal suspends itself in its natural resting attitude.

Only one young one is born at a time and this is carried about clinging to the breast of the mother.

By reason of their power of flight, Bats are more widely distributed than any Order of mammals, being found all over the world to the limits of tree-growth and in Oceanic Islands beyond the range of other mammals.

Classification of Bats. Bats are primarily divided into two groups or suborders, the *Microchiroptera* (Insectivorous Bats) and the *Mega-chiroptera* (Fruit-bats or Flying-foxes).

Suborder MICROCHIROPTERA (Insectivorous Bats)

These Bats take their scientific and popular names from the small average size of the species and the diet of insects which is characteristic of most of them. Their one distinguishing structural feature lies in the pinna, or broad upper part of the external ear, which is always open, never tubular, at the base; typically, their cheek-teeth have broad, sharply-cusped crowns fitted for crushing insects and even hard-shelled beetles.

Their distribution is the same as that cited for the Order. They are classified into some seventeen families, based on differences in the teeth, skulls and other skeletal characters, as well as variations in external features into which it would be profitless to enter; and the number of species (some six hundred) is so vast that only a few of the typical and of the more unusual types can be referred to.

To illustrate the habits and the structural features of the typical kinds, a few of the Common British species, which are also widely distributed in Europe, may be selected.

They are nocturnal, spending the day suspended by their hind legs in caves, old buildings or some sheltered spot and taking wing after sunset to feed. Their whole organization, apart from their eyes, which are minute and probably functional only for distinguishing light from darkness,

INSECTIVOROUS BATS (MICROCHIROPTERA)

is adapted for capturing and devouring prey in the air ; and they find it not by eye-sight, but by their acutely-developed senses of hearing and touch. It has been proved experimentally that one of these bats, deprived of its eyes, can fly about a room with strings running across it in all directions from wall to wall, without touching one of them. Apparently, they have the faculty of perceiving some subtle difference in the atmosphere close to an object without actually touching it. And this sense, which lies in the wings, ears and flaps of naked skin often developed on the nose, is of service in enabling bats to fly without risk of injury about the recesses of caves in pitch darkness and, aided by their sharp hearing, to detect the proximity of insects on the wing at night.

The old country name " Flitter-mouse " given to our bats was inspired by their familiar flickering twilight flight. While thus occupied they are hunting for food. Gnats, midges and small moths are snapped up and swallowed without delay ; but larger moths and biggish, hard-shelled beetles, not so easily disposed of, are dealt with by the method called " pouching," that is to say, the bat curls its tail forwards and converts the membrane it supports into a receptacle for holding the prey, which, with head bent down, it masticates at leisure, keeping all the while on the wing.

But although flight is the principal means of locomotion, bats are by no means dependent upon it. Even the best fliers are tolerably skilful climbers on rough surfaces and can shuffle along the ground with some speed, the momentum gained from their straddled legs being supplemented by the action of the hook-like thumbs of their wings ; and British bats, it is believed, sometimes hunt insects in that way in crevices or on rock-surfaces and tree-trunks.

During the winter in temperate latitudes, animals dependent for food on insects which disappear at that season must either hibernate or migrate to warmer countries. British bats meet the difficulty by hibernation, retiring in late Autumn to the secluded haunts where they spend the daytime in summer, and there remaining more or less dormant until the warmth of Spring rouses them and insects alike from their lethargy. But during mild spells, even in mid-winter, they may awake, crawl about their retreats and probably feed, even if not venturing into the open. Hibernation, however, is not practised by all bats inhabiting colder temperate latitudes. Some American species living as far north as Canada in the summer habitually migrate in winter to southern districts where insects are obtainable.



(W. S. Burdett.)
LONG-EARED BAT (*Plecotus auritus*).

In this species, the ears are enormous, nearly as long as the body.

MAMMALIA (ORDER CHIROPTERA)

Family Vespertilionidae (*Typical Bats*)

The majority of British bats, whose habits are epitomized above, belong to the cosmopolitan family *Vespertilionidae*, distinguished by the presence of a distinct flap, the tragus, at the base of the ear in front, by having a simple, hairy muzzle and the tail supporting throughout its length the membrane between the hind legs. The British members of this family are classified largely by variation in the numbers of their premolar teeth; but there are certain external characters by which, with some practice, they can be identified. The Noctule (*Nyctalus noctula*), typically rather a high flyer, may be known by its comparatively large size and narrow wings. The Serotine (*Eptesicus serotinus*) is about as large, but has broader wings. The Pipistrelle (*Pipistrellus pipistrellus*), the commonest and one of the smallest of all our species, is allied to the Serotine, but is very much smaller. The



VAMPIRE (*Vampyrus spectrum*).

[Clarke & Hyde.

This species has been shown to be guiltless of the charge of blood-sucking, despite the belief to the contrary of the natives of Brazil.

Barbastelle (*Barbastella barbastellus*) closely resembles the Pipistrelle in size, but has the ears united at the base on the summit of the head. Similar union of the ears occurs in the Long-eared Bat (*Plecotus auri-*

tus), but in this striking species the ears are enormous, and nearly as long as the body.

Family Rhinolophidae (*Horse-shoe or Leaf-nosed Bats*)

Although most of the British bats belong to the Vespertilionidae, there are two referred to a second family known as the Horse-shoe or Leaf-nosed Bats (*Rhinolophidae*), so-called from the presence on the summit of the muzzle of an elaborately-folded, sensitive membrane somewhat resembling a horse-shoe in shape. The ear also has no tragus; but otherwise these bats, called respectively the Greater Horse-shoe Bat (*Rhinolophus ferrumequinum*) and the Lesser (*Rh. hipposiderus*), which differ mainly in size, resemble the other British bats externally and in habits.

Family Nycteridae (*False Vampire Bats*)

Further variation in structure in adaptation to differences in diet and habits are illustrated by some exotic bats. In India there is a Leaf-nosed Bat, commonly known as the Indian Vampire Bat (*Megaderma lyra*),

VAMPIRE BATS



GREATER HORSE-SHOE BAT
(*Rhinolophus ferrumequinum*).

This Bat gets its name from an elaborately-folded sensitive membrane somewhat resembling a horse-shoe in shape, and situated on the summit of the muzzle.

belonging to a family (*Nycteridae*) differing externally from the Horse-shoe Bats in having a tragus in the ear. This Bat is not by any means exclusively insectivorous. In addition to large insects, its prey consists of smaller bats, little birds, frogs and even fish. Feeding largely upon animals which it catches and devours when at rest, it has no need for the aerial activity of the species hitherto considered nor for "pouching" its prey. It has, therefore, lost its tail as a com-

paratively useless organ. These bats have large canine teeth, but those of the upper jaw are separated by a wide, toothless space indicated by a deep notch in the skull. This character serves to distinguish them from the true tropical American Vampire Bats, in which the space between the upper canines is provided with teeth.

American Vampires (*Phyllostomidae*)

In America the name "Vampire" is given to several different kinds of bats which are supposedly, or actually, blood-suckers. Most of them have a well-developed nose leaf shaped like a spear-head and from this feature they are sometimes called the American Leaf-nosed Bats and are referred to the family of Old World Leaf-nosed Bats, mentioned above. The name Vampire belongs by rights to one of these American species which has been shown to be guiltless of the charge of blood-sucking, despite the belief of the natives of Brazil to the contrary, and it was given the scientific name *Vampyrus spectrum* in accordance with the reputation it formerly bore, for which its somewhat uncanny appearance was responsible. It is the largest of the insectivorous bats, having a wing expanse of about twenty-eight inches and a body between five and six inches long. It also has large ears and long, powerful jaws, armed with strong, sharp teeth, but the tail is absent. This Bat is also interesting



Photos]

[W. S. Berridge.

GREAT LEAF-NOSED BAT.

This species is so named because of the leaf-like membrane on the nose.

MAMMALIA (ORDER CHIROPTERA)

from feeding mainly on forest fruits, as well as insects, this mixed diet being unusual in Bats of this suborder.

Another large American Bat for which the popular name Javelin Vampire (*Phyllostomus hastatus*) has been proposed also has the reputation, supported by the testimony of some English naturalists, of being addicted to blood-sucking. But this requires confirmation. This species is nearly as large as the true Vampire and has a similar nose-leaf, but may be at once distinguished by possessing a tail.

Long-tongued Vampires. An interesting group of these bats, known as the Long-tongued Vampires (*Glossophaga soricina* and others), differs

from the foregoing in having a very long and highly-extensile tongue, beset with tooth-like warts, which in some cases is known to be used for clearing out the soft pulp of fruits after the Bat has bitten through the rind with its teeth. But in some of the species which, like the one quoted, feed apparently mainly, if not exclusively, on insects, the tongue is probably employed for licking them from the depths of flowers. The Bat in question is a smallish species, measuring about two inches long, and there is no truth in the view at one time held that it feeds on blood.

Blood-sucking Vampires (*Desmodontidae*). The true Blood-sucking Vampires are readily distinguished by the adaptation of their teeth to the habit from which they take their name. Two of the upper incisor teeth are very large, shear-like and meet in the middle of the jaw; and the canines behind them are similar in size and form. They have a small nose-leaf, but no tail. The best-known species (*Desmodus rufus*) is not a large Bat, its body measuring only about three inches long. It lies up by day in caves or hollow



[W. S. Berridge.
FLYING-FOX, OR FRUIT-BAT
(*Pteropus giganteus*).
This species inhabits India and Ceylon.
Each Bat will eat in a few hours fruit
amounting to twice its own weight if
it can secure it.

trees in Brazil and comes out after dark to search for the animals on whose blood it feeds, usually attacking them while asleep, and is a great pest to the live-stock of those camping in the forest at night. With its sharp teeth it insidiously scrapes away the outer skin even of horses and dogs and sucks up the blood that flows from the wounds.

Molossidae. In the account of the general habits of the Microchiroptera given above it was stated that the British species can climb and crawl with some agility, despite the impediment of their wing-membranes. In some exotic species this method of progression has been elaborated by increase in the use and strength of the hind legs and in the width of the foot. These Bats form a special family, the *Molossidae*, and the species

FRUIT-BATS (MEGACHIROPTERA)

which exhibits these adaptations for movement on the ground, tree-trunks or walls of caves, in the highest degree is the Naked Bat (*Chiromys torquatus*) of the Malaysian Islands. It is a clumsy, ugly animal with a somewhat pig-like head; the skin is nearly naked and wrinkled, the tail is long, and the toes of the broad feet are capable of being spread to give an extended grip and area of support. But its chief peculiarity lies in the wings, which rise close to the middle of the back, instead of from the flank, while beneath them a flap of the membrane forms a pouch, containing the nipples of the female, who carries her young in it. This bat is of large size, the head and body measuring about five inches in length.



GREY-HEADED FRUIT-BATS OR FLYING-FOXES (*Pteropus poliocephalus*) [Otto Webb.
These are native to the east coast of Australia. They are nocturnal, spending the day hanging to the branches of trees or to the walls of caves.

Sucker-footed Bats. Another modification subservient to climbing and locomotion on the ground, is the development of an adhesive disc on the thumb and sole of the foot. These suckers have been developed in two families of bats, the *Myzopodidae* and the *Thyropteridae*, which are otherwise akin to the *Vespertilionidae*. The former is represented by the Madagascar Sucker-footed Bat (*Myzopoda aurita*) and the latter by the tropical American Sucker-footed Bat (*Thyroptera tricolor*).

Suborder MEGACHIROPTERA (Fruit-bats or Flying-foxes)

In these bats the ear is tubular at the base, and since they feed upon easily-masticated fruit, the cheek-teeth have comparatively simple, narrow, weakly-cusped crowns. Although strong fliers, they have none of the general aerial activity of the smaller Bats, their flight being used to take

MAMMALIA (ORDER DERMOPTERA)

them to and from the roosting places and feeding grounds, and when on the wing they carry the hind legs stretched out behind to act as a rudder. Many of them are of large size, with an expanse of wing sometimes reaching four or five feet. They are confined to the Old World, where they range from Africa, through southern Asia to Australia. There are many different kinds, but all are referred to the family *Pteropodidae* and, so far as is known, are very similar in habits.

Living in countries where food is plentiful all the year round, they do not hibernate. But they are nocturnal, spending the day hanging to the branches of trees or the walls of caves, often in vast numbers. Towards sunset they take wing, making a bee-line for their feeding grounds and often travelling miles to reach them. When feeding, they hang head down, frequently by one foot only, using the other to hold the fruit steady while the mouth bites off pieces as large as it can take. They require a prodigious quantity of food, each Bat eating in a few hours fruit amounting to twice its own weight if it can secure it. Towards dawn they return to their cavern or tree. Perhaps the best known of these Bats are, the typical Flying-fox (*Pteropus giganteus*), from India and Ceylon, and the Grey-headed Fruit-bat (*P. poliocephalus*), from the east coast of Australia. A less familiar, but interesting, species is the Pigmy Fruit-bat (*Kioidotus minimus*), which is hardly larger than an average British Bat and is distinguished by having a very long, extensile tongue and greatly-reduced cheek-teeth. This modification of the tongue is similar to that of the Long-tongued Vampires (*Glossophaga*) in the Microchiroptera and serves the same purpose. This little Fruit-bat ranges from northern India throughout Malaya.

Order DERMOPTERA (Colugos or Flying Lemurs)

The classification of the Cobegos or Colugos (*Galcopithecus* and *Galcopterus*), also called Flying Lemurs, has been a great puzzle to zoologists. With the lemurs they have no near affinity; and although they have been placed in the Insectivora, the many peculiarities they present entitle them to rank as an Order by themselves. Their chief interest, perhaps, lies in their representing a stage through which the bats must have passed in their evolution. As in the typical bats, the skin is developed into great flaps involving the neck, limbs and tail, the neck being greatly lengthened to increase its extent. For the same purpose, the fore legs also are lengthened, so as to exceed the hind legs. But the great difference between the Colugos and the bats lies in the structure of the fore foot, which in the Colugo is a typical hand-like, padded paw with five normal digits armed with sharp claws, quite different from the "wing" of the bats.

In all the features mentioned above in connection with the flight membrane or *patagium*, the Colugos differ from the Insectivora, and in the conversion of each of the four front lower incisors into a comb composed of about nine teeth, they are unique in the mammalia.

COLUGOS OR FLYING LEMURS

There are two species of Colugos, the typical form originally regarded as a Flying Lemur (*Galeopithecus volans*), inhabiting the forests of the Philippine Islands, and Temminck's Colugo (*Galeopterus temminckii*), ranging from Siam and the Malay States to Borneo. But the differences between them are trivial and their habits are the same.

They are fairly large animals, comparable in size to a small cat, are nocturnal, arboreal and, so far as is certainly known, vegetable feeders, devouring fruits and leaves, although insects and small birds are said to be taken by them at times. So completely is their organization adapted to life in the trees and to their patagiate flight, that they are almost helpless on the ground. Of true flight, as exhibited by bats, they are incapable. The most they can achieve is planing from the higher branches of one tree to the lower branches of another, dropping about one foot in five on their course, although the distance thus covered may be as much as seventy yards. Colugos have not inaptly been described as Nature's experimental failure in the art of flying.

During the day they sleep hanging back downwards on the underside of branches, with the head and tail tucked between the fore and hind limbs respectively. Many travellers have testified to the difficulty of detecting them in this position or when clinging to a tree trunk, owing to the oblitative effect of their coloration. The colour varies individually but is usually some shade of olive-brown or black, profusely mottled on the upper-side with silvery-white spots simulating the lichen which speckles

the big boughs and trunks of the trees; and it is noticeable that the mottling does not affect the parts that are tucked out of sight when the Colugo assumes its sleeping attitude. The teats, like those of bats and primates, are on the breast; and the single young one, which is born blind and naked, is carried about by its mother as in those Orders and not reared in a retreat or nursery.



HAMMERHEAD BAT (*Hypsignathus monstrosus*).
In this African species the head and muzzle are large and exceptionally hammer shaped.



Photos]

[W. S. Berridge.

TUBE-NOSED BAT.

As will be seen from the illustration, this species derives its name from its tube-like nostrils.

Order PRIMATES

In his classification of the Mammalia, Man very naturally gives pride of place to the Order containing himself and his next of kin: So far as the higher members of the Order are concerned, this position is justified by brain-development and the intelligence that goes with it. But this does not apply to the lower, and the general organization of the Order is less specialized than in many others.

Owing to the survival of tolerably primitive types, the number of distinctive characters by which the Primates may be defined are not many. Apart from Man, however, one external feature serves to distinguish them from the rest of the placental mammals, namely the mobility of the hallux, the "great toe" in Man, which is usually very large, prehensile and opposable to the other digits of the foot. Even when quite small, as in the Marmosets, it can be folded inwards across the sole. The feet always have five digits and the hand also, except in one animal, the Potto, where the second digit is vestigial. For the rest, there are never more than two incisor and six cheek-teeth above and below on each side, making at the most a total of thirty-six. Usually, only a single young one, occasionally two, is born at a time in a tolerably advanced state of development, so that it is soon capable of being carried by its mother, clinging to her back or to her breast when suckling.

The Order Primates may be grouped in three Suborders as follows:

Suborder 1. Lemuroidea (Lemurs).

Families *Lemuridae* (Endrinas, Sifakas, Typical Lemurs and Mouse Lemurs), *Daubentoniidae* (Aye-aye), and *Galagidae* (Galagos, Lorises and Pottos).

Suborder 2. Tarsioidea (Tarsiers).

Family *Tarsiidae*.

Suborder 3. Pithecoidea or Anthropeidea (Monkeys and Apes).

A. *Platyrrhini* (American Monkeys and Marmosets).

Families *Cebidae* (Douroucoulis, Sakis and Uakaris, Titis, Capuchins, Squirrel Monkeys, Woolly Monkeys, Spider Monkeys and Howlers), *Hapalidae* (Marmosets and Tamarins).

B. *Catarrhini* (Old World Monkeys and Apes).

Families *Cercopithecidae* (Macaques, Mangabeys, Baboons, etc.), *Colobidae* (Langurs and Guerezas), *Simiidae* ("Man-like" Apes, i.e. Gibbons, Orang-utans, Chimpanzees and Gorillas).

Suborder LEMUROIDEA (Lemurs)

Although in their general shape, usually long tails, structure of their hands and feet, and short-haired faces set off by the longer hair of the head, the Lemurs resemble the typical monkeys, they may be at once

LEMURS (SUBORDER LEMUROIDEA)

distinguished by their narrow and pointed or long, fox-like muzzles, resembling those of ordinary mammals in the nostrils opening on an area of moist skin that divides the upper lip, which is adherent to the gum in front and is not protrusible; also the fourth digit of the hand and foot is the longest and the second digit of the foot always carries a claw, used for scratching the skin, the rest usually having flat nails.

There are also peculiarities in the teeth. These are usually the same in number as in the typical South American monkeys, but there is almost always a gap between the median upper incisors and the canines of the lower jaw, when present, lie alongside the small projecting incisors, forming with them a comb, which is kept clean by a finely-toothed plate on the lower side of the tongue, and is used for scraping the fur. In the skull the orbit, although encircled by bone, is not closed, but communicates freely with the space behind it.

The Lemurs are restricted to the warmer parts of the Old World and are the only members of the Primates found in Madagascar.

Madagascar Lemurs (Family *Lemuridae*)

Typical Lemurs (Lemurinae)

All the typical Lemurs commonly seen in captivity belong to the sub-family *Lemurinae*. They have the full number of teeth found in the Primates. The hands and feet are of moderate length, and are provided with well-developed, striated pads; the toes are free from webbing. These Lemurs are mainly arboreal animals and extremely active climbers, resembling the Old World monkeys in the way they leap about trees and in their quadrupedal walk on the ground. They are gregarious and active mostly after sundown and are very noisy, making the forest resound with their unearthly cries.

Ruffed Lemur (*Lemur variegatus*). This is the largest and handsomest species of the genus, its colour being black and white



(Needle-Kintzon)
BLACK AND WHITE RUFFED LEMUR
(*Lemur variegatus*).
This is the largest and handsomest species, and inhabits north-eastern Madagascar.

MAMMALIA (ORDER PRIMATES)

or black and red in various proportions, and there is a conspicuous ruff on the sides of the neck. The head and body measure about two feet and the tail the same. It inhabits north-eastern Madagascar.

Black Lemur (*L. macaco*). This is a smaller species, about the size of a cat, and takes its name from the colour of the male, which is black from birth, whereas the female is reddish-brown, with some white on the cheeks. In both sexes the ears carry fringes of long hairs. It is found in north-west Madagascar.

Brown Lemur (*L. fulvus*). This Lemur is about the same size as the last, but has shorter fringes on the ears and the sexes are usually alike in hue, but otherwise the colour is very variable, sometimes local, sometimes individual, and many different varieties have been named, such as the *Black-fronted*, the *Yellow-whiskered*, the *Red-footed*, the *White-fronted* and so forth. It is widely distributed in Madagascar and is found also in the Comoro Islands.

Ring-tailed Lemur (*L. catta*). This is the prettiest and commonest of all in captivity, its general colour being greyish-buff, with the tail conspicuously banded black and white. It is the only species of this group which has the heel of the foot naked beneath. This peculiarity is, perhaps, connected with its different habitat, for it lives in dry, poorly-timbered rocky districts of southern Madagascar and is only seldom found in the forest.



[F. W. Bond.

SMITH'S MOUSE LEMUR (*Microcebus murinus*).
Mouse Lemurs are nocturnal, arboreal and exceedingly active, passing from branch to branch by means of great leaps.

Mouse Lemurs (*Chirolgalinae*)

Another group of the Madagascar Lemurs, called Mouse Lemurs, contains a number of species of small size, distinguished by the great length of the foot, the presence of very large, coarsely-striated pads on the palms and soles, and by the larger ears. They are nocturnal, arboreal and exceedingly active, passing from branch to branch by means of great leaps; but the most interesting feature they exhibit is the habit

ENDRINAS AND SIFAKAS

many, at least, of them practise of lying up in a nest of leaves in a hollow tree and remaining torpid during the dry season when all food is scarce, living on a quantity of fat accumulated on the tail during the previous season. One of the most commonly imported is Coquerel's Mouse Lemur (*Microcebus coquereli*), which is brown in colour and about the size of a squirrel; the typical Mouse Lemur (*M. murinus*), the size of a half-grown rat, is usually greyish in colour and has very large ears.



[W. S. Berridge.

RING-TAILED LEMUR (*Lemur catta*) AND YOUNG.
The general colour is greyish-buff, with the tail conspicuously banded black and white.

Endrinas and Sifakas (*Indrisinae*)

The Lemurs popularly known as Endrinas and Sifakas are usually regarded as the highest types of this section. They are distinguished from the typical Lemurs by the reduction in the number of their teeth, their lengthened hands and feet, the smooth, padded palms and soles, and the webbing of the three inner toes. They are not exclusively nocturnal; they are gregarious and mainly arboreal, but on the ground their gait is not quadrupedal but semi-erect, the fore limbs not being employed for support. Their diet is purely vegetarian.

Endrina (*Indris brevicaudata*). This has a short, stumpy tail and big, hairy ears. It is the largest of existing Lemurs, standing when erect about three and a half feet high. Its colour is usually black, with the rump white, and it is restricted to the forests of eastern Madagascar.

Sifakas (*Propithecus*). These are a little smaller and have much longer tails, usually nearly as long as the head and body. They are found all over Madagascar and are represented by several species and local races, each restricted to its own area. The colour varies from white to black, white with brown or grey patches being common; all these varieties of

MAMMALIA (ORDER PRIMATES)

colour occur in the Dia-
demed Sifaka (*Propithecus diadema*) of eastern
Madagascar.

Aye-aye (Family *Daubentoniidae*)

The Aye-aye (*Daubentonia*, or *Chiromys*,
madagascariensis) forms
a family by itself,
mainly distinguished

from all other Lemurs by the resemblance of its teeth to those of the Rodents, there being only two very large gnawing incisors, above and below, separated by a long space from the small, flat-crowned cheek-teeth, which are reduced in number. This dentition is accompanied by various changes in the structure of the skull. Superficially, also, the Aye-aye differs in having coarse, shaggy hair, huge, leathery ears, and sharp claws on the thin fingers and toes, except on the hallux, and the fingers are long, the third being exceptionally slender. The animal is about the size of a cat and blackish-grey in colour. It is purely arboreal and nocturnal, feeding very largely on wood-boring beetle larvae, which it detects by its acute hearing and extracts by means of its thin, flexible finger when it has gnawed away the wood to expose their tunnels. Pairs only are found together and the female makes a nest of leaves for her single young one. Its home is on the eastern side of Madagascar, and it takes its popular name from the peculiar cry it utters.

AYE-AYE (*Daubentonia*, or *Chiromys*, *madagascariensis*).
The animal takes its popular name from the peculiar cry it utters.



African and Asiatic Lemurs (Family *Galagidae*)

The African and Asiatic Lemurs are distinguished from the typical Madagascar Lemurs by a few anatomical characters and constitute a group by themselves. They are popularly known as Galagos, Pottos and Lorises.

Galaginae. The

[Photos]

MONGOOSE LEMUR (*Lemur mongoz*).

[W. S. Berridge.

GALAGOS, POTTOS AND LORISES

Galagos or "Bush-babies" (*Galago*) superficially resemble the Mouse Lemurs of Madagascar, having long feet, long, hairy tails and large, membranous ears and, like Mouse Lemurs, they are extraordinarily active climbers, taking prodigious leaps from branch to branch. On the ground they bound like kangaroos. But they are mainly arboreal and, being also nocturnal, spend the day curled up asleep in a hollow tree stem or in a nest made of leaves in the fork of a tree, coming out at night to hunt for food, which consists of fruit, insects, eggs or occasionally small birds. They are found only in the forests of tropical and southern Africa, and are represented by several species, of which two are the best known. The Thick-tailed or Garnett's Galago (*G. crassicaudatus*) is a tolerably large animal, the head and body being about a foot long, or a little more, and the tail about the same. The colour varies locally, but is usually brownish-grey. It is widely distributed. The other, the Moholi Galago (*G. moholi*) is only about half the size of the other, but exhibits similar local variation in colour and is equally widely distributed. In South Africa this pretty little animal, which is often kept as a pet, is known as the "Bush-baby."



[F. W. Bond.]
DEMIDOFF'S GALAGO (*Galago demidoffi*).
Galagos are extraordinarily active climbers, taking prodigious leaps from branch to branch. On the ground they bound like kangaroos.

Lorisinae. The Pottos and Lorises differ from the Galagos in having the tail short, the ears small, the foot only as long as the hand, and the thumb as large as the great-toe, both being capable of great backward extension so that the span is very large. These differences are adaptations to differences of habit. Although nocturnal and arboreal, the Pottos and Lorises are unable to leap, and when prowling about the trees at night, they move with a slow, deliberate walk, gripping the branches with astonishing tenacity. In diet they resemble the Galagos and, despite their slowness, are adepts at catching resting insects with their hands.

Pottos. The Pottos (*Perodicticus*) are distinguished by having only three complete fingers, besides the thumb, on the hand, the forefinger being vestigial. The Common Potto (*P. potto*) has a tail usually about two inches long; its general colour is reddish or greyish-brown and its

MAMMALIA (ORDER PRIMATES)

total length about one foot. It inhabits the forests of Central Africa. Another rare species, the Calabar Potto (*Arctocebus calabariensis*), has no visible tail and larger ears. It has been found only at Calabar in West Africa.

Lorises. The Lorises have the forefinger of the hand well developed and no visible tail. There are two very distinct kinds restricted to tropical Asia. The best known is the Slow Loris (*Nycticebus coucang*), which in its short,

strong limbs and robust build resembles the Pottos and has many local varieties, differing in colour. It ranges from Assam to Cochin China and Borneo.

The Slender Loris (*Loris tardigradus*) is less stoutly built, has remarkably long and thin arms and legs, and is found only in southern India and Ceylon.



SLENDER LORIS (*Loris tardigradus*).

This Loris has remarkably long and thin arms and legs, and is found only in southern India and Ceylon.

Suborder TARSIOIDEA (Tarsiers)



Photos]

THICK-TAILED OR GARNETT'S GALAGO
(*Galago crassicaudatus*).

[W. S. Berridge.

Galagos are found only in the forests of tropical and southern Africa.

The sole survivor of an extinct group is the little Primate known as the Tarsier (*Tarsius*). It stands nearly midway between monkeys and lemurs and is sometimes classified with the former, sometimes with the latter, or as a compromise, is given independent rank. In the genus there are seven species known to science. In its skull and teeth, and the structure of its lips and nose, it is more monkey-like; but in general appearance, in its large eyes and very long, hopping feet it re-

TARSIERS (SUBORDER TARSIOIDEA)



COMMON POTTO (*Perodicticus potto*).

The general colour of this animal is reddish or greyish-brown and its total length about one foot.

as the head and body, and the soft fur is generally brownish, but varies in tint in different kinds. It ranges from Sumatra to the Philippines and Celebes. In habits it is nocturnal, insectivorous, arboreal and extraordinarily active; but it passes from branch to branch by hopping and traverses the ground in the same way. During the day it lies up in holes in tree stems or under projecting roots. It has the very unusual power of turning the head round so that the face can look backwards without the body moving. Under a bright light the pupil of the eye contracts to a narrow slit as in cats. The typical species (*T. tarsius*) is found in the Malayan Islands.

Suborder PITHECOIDEA or ANTHROPOIDEA (Monkeys and Apes)

This suborder, comprising the Apes and Monkeys, is distinguishable at a glance from the Lemuroidea by the structure of the muzzle, which is man-like in having no area of naked,

sembles a little lemur of the galago group (page 849), except that the eyes are enormously larger. The fingers and toes have flat nails, except for the second and third toes which have claws. All the fingers and toes have at their extremities sucker-like discs, which enable the animal to cling firmly to the branches of trees. The size about equals that of a small rat, the tail is nearly twice as long



[Photos]

SLOW LORIS (*Nycticebus coucang*).
This Loris ranges from Assam to Cochin China and Borneo.

[W. S. Berridge.]

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moist skin surrounding the nostrils and dividing the upper lip, the upper lip itself being free from the gum and, like the lower lip, protrusible so that water can be sucked into the mouth, instead of lapped. In the hands and feet the third or middle digit is usually longer, never shorter, than the fourth. With regard to the teeth, the median upper incisors are never separated by a gap, the lower canines and incisors never project forwards to form a fur-comb. The tongue has no finely-toothed plate on its lower side and in the skull the eye-sockets (orbits) are closed at the back by bone.

There are two divisions of the Anthropoidea, the *Platyrrhini*, or Monkeys and Marmosets of America, and the *Catarrhini*, or Apes and Monkeys of Africa and Asia.

AMERICAN MONKEYS AND MARMOSETS (*Platyrrhini*)

These are distinguished from the monkeys of the Old World by having three premolar teeth above and below in each jaw and in the absence of a bony floor to the ear opening in the skull. Generally, but not always, the nostrils are widely separated. The tail is frequently prehensile, which is never the case among the Old World Monkeys.

There are two families, the *Cebidae* (Spider Monkeys, Howlers, Capuchins, etc.) and the *Halimidae* (Marmosets).

Family *Cebidae* (*Douroucoulis*, *Sakis* and *Uakaris*, *Titis*, *Capuchins*, *Squirrel Monkeys*, *Woolly Monkeys*, *Spider Monkeys* and *Howlers*)

In this family the fingers and toes have compressed nails, and the hallux is large and opposable to the other digits of the foot.

These monkeys do not differ in habits from the arboreal Monkeys of Africa and Asia, except that they are less active climbers.

Douroucoulis or "Night Apes" (*Aotes*). These are distinguished from the rest of the South American monkeys by having, relatively, very large eyes adapted for nocturnal vision and the pads on the hands and feet exceptionally well developed, coarsely



HUMBOLDT'S SAKI OR HAIRY SAKI (*Pithecia monachus*).
Among the Sakis are some of the quaintest-looking and ugliest monkeys in the world; the growth of the hair on the head is very varied but always eccentric.

"NIGHT APES," SAKIS AND UAKARIS

striated and no doubt, highly sensitive for feeling in the dark. In both of these particulars, these monkeys adaptively resemble the nocturnal lemurs. In the skull the most noticeable peculiarity is the enormous size of the orbits to accommodate the eyes. They are small monkeys, with



[W. S. Berridge.

NIGHT APE (*Aotus*).

The eyes are, relatively, very large and adapted for nocturnal vision.

long, non-prehensile, bushy tails, small, round faces, weak jaws, and small ears. The general colour is usually greyish or brownish, but the face is white, broken by black stripes and black round the eyes. They are widely distributed in the forests of South America and are arboreal, spending the day asleep in some hollow tree-trunk and coming out at night to hunt for insects, eggs, small birds and fruit on which they feed. Their voice is loud, resembling a "caterwaul." A very large number of names have been given to various kinds, differing slightly in colour, the best-known being the Three-banded Douroucoulis (*A. trivirgatus*) from the northern districts of South America.

Sakis and Uakaris (*Pithecia*, etc.). The Sakis represent a group distinguished by having very long, projecting incisor teeth. To this group belong some of the quaintest-looking and ugliest monkeys in the world, the growth of the hair on the head is very varied, but always eccentric, and the hair on the body is long and shaggy. These monkeys inhabit the forests on the banks of the large rivers of South America, seldom coming to the ground, but they are not active climbers and apparently feed solely on fruits. There are many different kinds, but only one or two of the most striking can be mentioned.

The Red-backed Saki (*Chiropotes chiropotes*) has the head, arms, legs and tail black and the back reddish. The head is very human in appearance owing to the hairs on the crown rising on each side from a parting and falling over the ears, while the cheeks and throat are provided with whiskers and beard growing like a "Newgate Frill." It inhabits the banks of the Amazon and Orinoco in northern Brazil and Venezuela, and is of medium size, the head and body measuring about one and a half feet and the tail one and a quarter feet. The scientific name of this monkey alludes to its alleged habit of drinking by picking up water in its hands.

The Red Uakari (*Cacajao rubicundus*) is a very different-looking monkey from the Red-backed Saki. It is red all over, even the skin of the face;

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and the tail is short, shorter than the hind legs. More marked still is the difference in the hair of the head. The "Newgate Frill" is developed, but instead of the luxuriant crop on the crown, the hair here is so short that it looks as if cropped close with a pair of scissors, so that at a little distance the head seems bald. This monkey is found in the forests to the north of the Amazon.

The White-headed Saki (*Pithecia pithecia*) has a long tail like the Red-backed Saki, but the coat is longer and shaggier and curly on the tail. The face is encircled with white hairs, forming bushy whiskers on the

cheek, the rest of the head and body being covered with black hairs in the male and black, grey-tipped hairs in the female. This species also inhabits northern Brazil and Guiana.



[W. S. Berridge.

RED UAKARI (*Cacajao rubicundus*).
This monkey is red all over, even the skin of the face.

Titis (*Callicebus*). These form a group by themselves, distinguished by skull characters. In their small size, varied colouring and non-prehensile tails, they resemble the Squirrel Monkeys (page 856), but they have longer and shaggier fur. They are infrequently imported to this

country. The Collared Titi (*C. torquatus*) is brown above, red below, with the neck and hands white, and the tail and feet black; it inhabits northern Brazil. The Grey Titi (*C. gigot*), from southern Brazil, is grey with a red tail and black hands. These two are, perhaps, the commonest species.

The Capuchins and Squirrel Monkeys constitute a group that approaches the Spider Monkeys and their allies, but differs in skull-characters and in the absence of the features subservient to the special arboreal activities typical of that group. In general form they more closely resemble the Old World Monkeys, especially in the proportions of their limbs, their more efficient thumbs, shorter hands, and relatively longer feet. In trees they leap from branch to branch and run along their upper sides when climbing at speed. Their diet consists mainly of insects, eggs and berries.

CAPUCHINS (CEBUS)

Capuchins (*Cebus*). These have the tail prehensile, but not nearly so efficiently as in the Spider Monkeys, its underside being typically hairy to the tip. It is used for climbing, and, in captivity, at least, for carrying objects like paper-bags. Like other South American monkeys, they are arboreal, going about in troops, but in their habits there is nothing specially noteworthy. In captivity they are lively, intelligent and, on the whole, docile. Their habitat



CAPUCHIN (*Cebus*).

The tail is used for climbing, and, in captivity, at least, for carrying objects like paper-bags.



Photos]

COMMON SQUIRREL MONKEY (*Saimiri sciurea*).
This is a native of Guiana and Venezuela.

[W. S. Berridge.

is the forested districts of Central and South America. A large number of different kinds have been described, but they are not well understood. A well-marked species, however, is the White-throated Capuchin (*C. capucinus*), in which the forehead is bald and the body black, with a white throat and cheeks. The head and body are about one and a half feet in length and the tail a little more. It is found in Central America and Colombia. In the rest of the Capuchins the tip of the tail is hairy. As an example may be cited the Brown

MAMMALIA (ORDER PRIMATES)

Capuchin (*C. fatuellus*), which is typically brown in tint and has the hair on the top of the head, especially in the males, raised into two crests. It is about the size of the last-named species, and is common in Guiana.

Squirrel Monkeys (*Saimiri*) are smaller and more delicately built than the Capuchins and have weaker jaws, longer heads and a non-prehensile tail. They are also more brightly coloured, the face being commonly flesh-coloured, with bluish lips, the body greyish, washed with yellow or red, the head sometimes black with white cheeks and the throat and the hands and feet ochre. In size the head and body measure about one foot and the tail is one and a quarter feet long. Several kinds, differing

in colour, from various parts of the forested districts of South and Central America have been described: the Common Squirrel Monkey (*S. sciurea*), inhabiting Guiana, Venezuela, etc.; and the Red-backed Squirrel Monkey (*S. orstedii*), from Panama and Nicaragua being the commonest. In their habits and diet these pretty little monkeys resemble the Capuchins.



RED-FACED SPIDER MONKEY
(*Ateles paniscus*).
[W. S. Berridge.]

This is typically black all over, with the face flesh-coloured.

The Woolly Monkeys, Spider Monkeys and Howlers form a group distinguished from the preceding by some well-marked characters in the skull and by the perfection of the tail as a prehensile organ, several inches of its lower side at the end being quite naked, very sensitive and finger-like. They are the most highly-specialized climbers amongst the South American Monkeys, not leaping from branch to branch, but traversing trees rather after the manner of the Orang-utan,

with the added help of the tail.

Woolly Monkey. The least modified of the group is the Woolly Monkey (*Lagothrix*), distinguished by having a well-developed thumb set close to the next finger of the hand and the vocal organs unmodified. There are one or two species which derive their popular name, for which "Negro Monkey" is sometimes substituted, from their soft, thick, woolly fur. The better-known of the two species usually imported to this country is Humboldt's Woolly Monkey (*L. humboldtii*), which is grey in colour, with a black-faced head. It is a tolerably large monkey, the head and body measuring about two feet, and the tail a little over. It inhabits the forests of the Upper Amazon, and feeds on fruits of various kinds.

SPIDER MONKEYS

Spider Monkeys. The Spider Monkeys differ from the Woolly Monkey in having the thumb absent or vestigial and, when vestigial, not close to the next finger of the hand. They are also more slenderly built.



WOOLLY MONKEY (*Lagothrix*).
Because of the soft, thick, woolly fur, this is often called the "Negro Monkey."

One rare species, the Woolly Spider Monkey (*Brachyteles arachnoides*), is of interest from its resemblance in the woolliness of its coat to the true Woolly Monkey. It is at least as large as the latter and its general colour, although very variable, is greyish-brown, the face being pale. Nothing has been recorded of its habits, except that it lives in the forests of south-eastern Brazil.

The true Spider Monkeys (*Ateles*) have long, shaggy coats; their arms are longer than their legs, with the hands nearly equalling the feet. They live in the tree-tops of the forests of the warmer parts of Central and South America, and feed mainly on berries and other fruits. Constant hunting by the Indians, who are partial to their flesh, has made them

shy of human beings in the wild state and they greet the appearance of passers-by on the ground beneath by uttering barking cries, probably to warn their companions of danger, and by breaking off twigs and fruits and letting them fall upon them. But in captivity they are fearless, docile and lively when in health. The tail is used not only for securing a firm hold upon branches, but for grasping and plucking



Photos] VARIEGATED SPIDER MONKEY (*Ateles variegatus*).
[W. S. Berridge.
Spider Monkeys use the tail not only for securing a firm hold on the branches, but for grasping and plucking fruit beyond the reach of the hands.

MAMMALIA (ORDER PRIMATES)

fruit beyond the reach of the hands. It resembles an elephant's trunk in sensitiveness, flexibility and grasping power.

Many different kinds, differing from each other mainly in colour, have been described, but most of them are probably local or individual varieties of the Red-faced Spider Monkey (*Ateles paniscus*), which is typically black all over, with the face flesh-coloured, and which inhabits the valley of the Amazon. A second, the Black Spider Monkey (*A. ater*), inhabiting the same district, differs only in having the face black. But the most curious variety of all is the Hooded Spider Monkey (*A. cucullatus*), in



[F. W. Bond.

BLACK HOWLER (*Alouatta caraya*).
These monkeys derive their name from the resonant and discordant howls they emit from the tree-tops.

which the hairs of the forehead project over the face, like an eye-shade. Its general colour is yellowish-brown, due to a mixture of black and yellow hairs; its distribution is unknown. The average length of Spider Monkeys is rather less than two feet for the head and body, the tail being a little more.

Howlers (*Alouatta*). These resemble the Woolly Monkey in the structure of the hands, feet and tail, but are distinguished from them and from all the other members of the family by the modifications of the skull connected with the organs of voice which produce the resonant howls from which they take their name. The principal modification is the expansion of the bone, the hyoid, at the upper end of the wind-pipe into a great hollow sound-box, the lower jaw being much enlarged and spread to

accommodate and protect this structure. These monkeys, found in the forests of Central and South America, are almost exclusively arboreal, but are slow, inactive climbers, feeding mainly on foliage. All travellers acquainted with them testify to the unearthly, discordant noise they emit from the tree-tops, but accounts differ as to the time the chorus is performed, some affirming that it starts at dark and is carried on till dawn, others that it is performed to salute the rising sun or that it may be stimulated by dull, cloudy weather at any hour of the day. The full-grown males have the most resonant voices; but the purpose of the howling is quite unknown. Several species of Howlers have been named, mostly on trivial characters like colour. As instances may be quoted: the Red Howler (*Alouatta seniculus*), the Black Howler (*A. caraya*), the Yellow-handed Howler (*A. belzebul*). They do not appear to differ in habits, and in captivity they seem dull, lazy, unintelligent animals, never living for long.

MARMOSETS (FAMILY HAPALIDAE)

Family Hapalidae (*Marmosets and Tamarins*)

These little Monkeys, squirrel-like in size and arboreal activity, differ from the Cebidae in having the nails converted into claws for gripping the bark of trees, and the hallux, no longer required for grasping branches, reduced so as to be of very little use for prehension. Typically, also, they have only five, instead of six, cheek-teeth, the last molar being lost. Hence, numerically these teeth are the same as in the Old World Monkeys, but there are three premolars and two molars, instead of two premolars and three molars. In all the species the tail is long and hairy, never prehensile. Their habitat is the forests of South and Central America, Brazil being their headquarters.

They are mainly insectivorous in diet, eating moths, flies, which they skilfully catch with their hands, spiders, grubs and so forth. Although very popular as pets, they never thrive long in captivity without abundance of insect food. Of the many different kinds, a few only are commonly imported to this country.

Göldi's Marmoset (*Callimico goeldii*) must be mentioned as a connecting link between the Marmosets and the other South American Monkeys, having the hands and feet of the former and the teeth of the latter, there being six cheek-teeth above and below on each side, instead of five as in other Marmosets.

The best-known Marmoset is the Ouistiti (*Hapale jacchus*), distinguished by the long, fringe-like tuft of white or black hair on the ears, the mottled black, greyish-buff body-colour, and the banded tail.

The Marmosets called Tamarins (*Mystax*) are blacker in colour than the typical species and have no tufts on the ears, but are principally distinguished by the lower incisor teeth being short, shorter than the canines, instead of lengthened to equal the canines. The Negro Tamarin (*M. ursulus*) may be known by its tolerably uniformly black colour; the Red-handed Tamarin (*M. midas*) by its reddish hands and feet; and the



(W. S. Berridge.)
COMMON MARMOSET OR OUISTITI
(*Hapale jacchus*).

This is distinguished by the long, fringe-like tuft of white or black hair on the ears, and the banded tail.

MAMMALIA (ORDER PRIMATES)

Moustache Tamarin (*M. mystax*) by a conspicuous tuft of white hair, like a moustache, on the upper lip.

The Pinché Marmoset (*Oedipomidas oedipus*) resembles the Tamarins in tooth-structure, but has the ears much reduced in size and the cheeks naked, or nearly so. It is a parti-coloured species, with a white crest on the crown, the body is brownish above, white below, the limbs are reddish, and the tail mostly black. It inhabits Colombia.

The Lion Marmoset (*Leontococcus rosalia*), so-called from the long, mane-like hair on the neck and shoulders, while resembling the Tamarin and Pinché in its teeth, is distinguished from them and from the typical Marmosets by having the hands lengthened to equal the feet. The colour is golden-brown all over.



[W. S. Berridge.
MOUSTACHE TAMARIN (*Mystax mystax*).
This Tamarin has a conspicuous tuft of white hair, like a moustache, on the upper lip.

It is sometimes known as the Silky Tamarin, and is a native of south-eastern Brazil.

CATARRHINI (Apes and Monkeys of Africa and Asia)

Two characters in the skull serve to distinguish this group from the Platyrrhini, namely the presence of two premolar teeth only above and below on each side, and the lengthening of the orifice of the ear by a floor of bone. The scientific name Catarrhini alludes to the narrowness of the space between the lower ends of the nostrils, which in these Monkeys and Apes are typically convergent slits, whereas in the American Monkeys the nostrils are



[F. W. Bond.
LION MARMOSET (*Leontococcus rosalia*).
This is so-called from the long, mane-like hair on the neck and shoulders.

DOG-LIKE MONKEYS (CYNOMORPHA)

usually widely separated. But the character is too variable to be cited as distinctive.

In the Catarrhini the tail is never prehensile, as it sometimes is in the Platyrrhini, but the former often possess large cheek-like pouches and frequently have bare patches on the hindquarters, which are never features of the New World Monkeys.

The Catarrhini themselves are referred to two tribes, the *Cynomorpha* or Dog-like Monkeys, and the *Anthropomorpha*, containing the family Simiidae, or the Man-like Apes.



GRIVET MONKEY (*Cercopithecus aethiops*).
[W. S. Berntsen.]

CYNOMORPHA (Dog-like Monkeys)

The Monkeys of Asia and Africa have the arms and legs nearly equal in length, the hands much shorter than the feet, with the weak thumb tied closely to the palm and emerging from the middle of its inner edge,



WHITE-COLLARED MANGAHEY (*Cercopithecus collaris*).
This handsome species is blackish and chestnut in colour, with a white collar, and is found in Nigeria.
[James's Press.]

and the pads of the soles and palms comparatively well-developed. In walking on the ground in the quadrupedal attitude, the fore and hindquarters are nearly on a level, part or whole of the palm of the hand is applied to the ground, but the heel of the hind foot is raised off it; rapid progression through trees is effected by a series of leaps, the propelling power lying in the strong, springy hindquarters and legs. It is on

MAMMALIA (ORDER PRIMATES)

account of their resemblance to typical quadrupedal mammals in their attitude and way of moving on the ground that these monkeys are called

Cynomorpha, or dog-like; and in their method of climbing they do not differ essentially from arboreal mammals like squirrels. The period of gestation is seven months.

There are two families in this group: the *Cercopithecidae*, including the Mangabeys, Macaques, Baboons and their allies, and the *Colobidae*, including the Langurs and Guerezas.

Family Cercopithecidae (Mangabeys, Baboons, Macaques, etc.)

The monkeys of this family are distinguished by having cheek-pouches and a simple saccular stomach. Their diet and habits are very varied. They are omnivorous, eating fruits, nuts and vegetables of all kinds, as well as quantities of insects, even crabs sometimes, and small mammals, birds and their eggs. Their habitat may be forest, bush or rocky hill-sides; but the arboreal species are never so active in the trees as the Langurs and Guerezas (pages 870-872). Except that the young are typically duskier in hue, they do not differ appreciably



[D. Seth-Smith.
ANOTHER VIEW OF THE GRIVET MONKEY
(*Cercopithecus aethiops*).
This monkey is mainly arboreal and a native of Abyssinia.

GUENONS (FAMILY CERCOPITHECIDAE)

from their parents in colour.

These monkeys are found all over Africa, except in the deserts, and in south-eastern Asia, from India, China and Japan to Celebes.

A group of these monkeys, sometimes called Guenons (*Cercopithecus*) and distinguished by some peculiarities in dentition, is found all over Africa, south of the Sahara. They are mainly arboreal and all have long, straight tails. The species, of which there



[F. W. E. B.]

SCHMIDT'S WHITE NOSED MONKEY
(*Cercopithecus delacourista* Schmidt).

A heart-shaped patch of white hair in the nose is one of the distinguishing marks of this monkey.



[D. Seth-Smith.]

ROLOWAY DIANA MONKEY (*Cercopithecus diana roloway*).
The black face, white brow-band and white, pointed beard are characteristic of the Diana monkey.

are a great many different kinds, fall into two ill-defined groups, one of which is represented by the so-called Grass Monkeys, which are greenish-grey in colour, with sooty-black faces. As examples may be cited the Green Monkey (*C. sabacus*) of Sierra Leone, the Grivet (*C. aethiops*) of Abyssinia, and the Vervet (*C. pygerythrus*) of South Africa. They are about the size of house cats and usually frequent the bush and jungles on the river banks. The second group contains a large number of species, often handsomely coloured and quaintly decorated on the head in a variety of

MAMMALIA (ORDER PRIMATES)



[James's Press.

ANUBIS BABOON (*Papio anubis*)

This is a large olive green species ranging from East Africa to Nigeria.

ways. The Diana (*C. diana*) has a black face, with a white brow-band and a white, pointed beard; the White-nosed Monkey and the Putty-nosed Monkey (*C. ptaurista* and *C. nictitans*) have a heart-shaped patch of white hair on the nose; the Moustached Monkey (*C. cephus*) has a blue band on the upper lip and a patch of yellow on the cheek. Many more instances could be cited. These monkeys are found mainly in the forested parts of Africa, and no doubt their patterns are protective, since patchy faces, like those described, would

never be seen peering through the foliage.

The Patas Monkey (*Erythrocebus patas*), called in the trade the Hussar, on account of its sandy-red colour, is a large, long-legged relation of the Grass Monkeys, inhabiting open bush and rocky country in the Soudan. It is mainly terrestrial and so swift a runner that it requires a tolerably good pony to overtake it.

Mangabeys. The Mangabeys (*Cercopithecus*) are long-tailed, very active arboreal monkeys inhabiting the forests of Central Africa, and differing from the last genus in the structure of their teeth, their larger size and other particulars. There are several species, including the Sooty Mangabey (*C. fuliginosus*), a uniformly slate-grey Monkey inhabiting Sierra Leone and the White-collared Mangabey (*C. collaris*), a



[F. W. Bond.

CHACMA BABOON (*Papio porcarius*).

This is a South African species.

BABOONS (PAPIO)

handsome species, blackish and chestnut in colour, with a white collar, found in Nigeria. An interesting point connected with these Monkeys is their kinship with the Baboons, of which they represent the ancestral stock.

Baboons. The Baboons, or Dog-faced Monkeys (*Papio*) resemble, as stated, the Mangabeys in many respects, but are distinguished by their large, dog-like muzzle due to the lengthening of the jaws and the development of a definite nose with the nostrils on it opening forwards. The tail, too, is only moderately long and is always carried in an arch. Baboons are large, powerfully-built monkeys, mainly terrestrial in habit and living on rocky hill-sides, for the climbing of which their fingers and toes are thick and short. They are, perhaps, the most intelligent of the Monkeys,



[Platylabus *Hagoraka's Twopark, Stirlington.*

HAMADRYAS OR ABYSSINIAN BABOON (*Papio hamadryas*).
This Baboon is greyish in colour and the male carries a great cloak of long hair on his shoulders and a tuft on his tail.

with the troop-instinct highly developed even to the extent of combination in the capture of prey. Several, for example, have been known to hide in the bushes fringing a forest path and spring upon passing antelope as large as sheep. In South Africa lambs and kids are sometimes killed by them. They feed, indeed, to a greater extent upon animal food than any of the Monkeys, devouring scorpions, centipedes and a variety of beetles and other insects, in search of which they overturn big stones: but they also eat roots, fruits and other vegetables. By reason of their great strength, they are formidable beasts to interfere with. A full-grown male is a match for a large dog and a troop has been known to turn upon a leopard which pounced upon a young one.

MAMMALIA (ORDER PRIMATES)

Baboons are found all over Africa, south of the Sahara, outside the Congo forest area. Five well-defined species are known, namely the Chacma Baboon (*P. porcarius*) of South Africa, the Yellow Baboon (*P. cynocephalus*) of East Africa; the Anubis Baboon (*P. anubis*), a large olive-green species ranging from East Africa to Nigeria; the Guinea Baboon (*P. papio*), the smallest of all and ginger in hue; and lastly, the Hamadryas Baboon (*P. hamadryas*), from the mountains of Abyssinia and southern Arabia, which is greyish in colour, the male carrying a great cloak of long hair on his shoulders and a tuft on his tail. This species, also known as the Sacred Baboon, is depicted on ancient Egyptian monuments.

The Mandrill (*Mandrillus sphinx*) and the Drill (*M. leucophaeus*) differ from the typical Baboons in having the tail reduced to a mere stump; the foot also has a very much longer prehensile great-toe, which is adapted for grasping the thick boughs of the trees in which they live. For, unlike the Baboons, these species are mainly arboreal, escaping to trees when hunted and sleeping in them at night. They are found in the forests of West Africa and are as large and powerfully built as Baboons. The adult male Mandrill is one of the most eccentric-looking of all Monkeys. The general hue is dark olive, but the rump is rainbow-tinted; on the top of the muzzle there are two bluish, sausage-shaped swellings, the end of the nose round the nostrils is carmine and the chin has a short, yellow beard. The Drill is browner in colour, with the face black.

Besides the Hamadryas Baboon another big monkey, the Gelada

(*Theropithecus gelada*), lives in the mountains of Abyssinia and has the shoulders maned and the tail tufted, and is remarkable for its small, paw-like hands and feet adapted to rock climbing. It is as big as a medium-sized dog and mostly blackish-brown in colour, and has a deep but short muzzle and a small, fleshy nose. Its habits seem to be the same as those of Baboons and it is generally, but quite erroneously, supposed to be one of those animals.



[F. W. Bond.

BONNET MACAQUE (*Macaca radiata*).

The name is derived from the quaint-looking cap of radiating hair on the crown of the head.

MACAQUES (MACACA)

Macaques. The Monkeys of Asia belonging to this family are popularly known as Macaques (*Macaca*). They are most nearly related to the Mangabeys, but differ from them in certain cranial and other characters and in being less arboreal in their habits. They range all over south-eastern Asia as far as Celebes, and there are about a dozen well-defined species, differing from each other in size, colour and particularly in the length of the tail. Their habitat is also varied from jungles on river banks to rocky hill-sides.



(W. S. Berridge.)

MANDRILL (*Mandrillus sphinx*).

On the top of the muzzle of the adult male there are two bluish, sausage-shaped swellings, the end of the nose round the nostrils is carmine and the chin has a short, yellow beard.

The species commonly exhibited in this country is the Rhesus or Bandar Macaque (*M. mulatta*), which may always be known by its tail of medium length and by the bright, orange-red hue of its hindquarters. It is common in the plains of northern India, up to five thousand feet in the Himalayas, and ranges thence eastward to Siam and northward as far as Pekin. In some places it frequents precipitous hill faces, in others, jungles on the river banks.

Equally commonly imported is the Bonnet Macaque (*M. radiata*) of southern India, which has a near ally in Ceylon known as the Toque (*M. sinica*). In these the tail is long, and their names are derived from the quaint-looking cap of radiating hair on the crown of the head.

A third Indian species, much rarer than the last, is the Wanderoo (*M. silenus*), which is black, with a thick ruff of long, grey hair round the face and a shortish, tufted tail. It is restricted to the forests of Travancore.

The so-called Common Macaque (*M. irus*), also known as the Crab-eating

MAMMALIA (ORDER PRIMATES)

Macaque, is like the Bonnet Macaque in having a long tail, but is without the cap on the crown. It ranges from Burma and Siam all over the Malayan Islands to the Philippines, and is represented by numerous local races differing in colour from olive or reddish to black. In Burma it frequents creeks and river banks, feeding, amongst other things, on crabs, whence its popular name is derived.



PIG-TAILED MACAQUE (*Macaca nemestrina*).
This is a formidable and powerful animal that derives its popular name from its short, thin tail carried in an arch over the buttocks.

The finest of all these Monkeys is the Pig-tailed Macaque (*M. nemestrina*), the male of which is as big as a Baboon or small mastiff and is a formidable, powerful animal, known, from its record of occasionally killing children, to be dangerous to human life in the Malay Peninsula, whence the typical race, brown and black in colour, ranges to Borneo. A smaller, greyer kind inhabits Burma and Siam. Its popular name is derived from its short, thin tail

carried in an arch over the buttocks as in the Baboons.

Of the remaining species inhabiting eastern Asia, it is only necessary to mention the Stump-tailed Macaque (*M. speciosa*), inhabiting Assam, Burma and Siam; the Japanese Macaque (*M. fuscata*), a thick-coated, dusky-hued monkey, with the tail rather shorter than in the Rhesus; and the Moor Macaque (*M. maura*), a very short-tailed species found in Celebes and the neighbouring



[Photos]
WANDERER OR LION-TAILED MACAQUE (*Macaca silenus*).
This is a black species, with a thick ruff of long, grey hair round the face. The tail is shortish and tufted.

[W. S. Burdett.]

MACAQUES (MACACA)



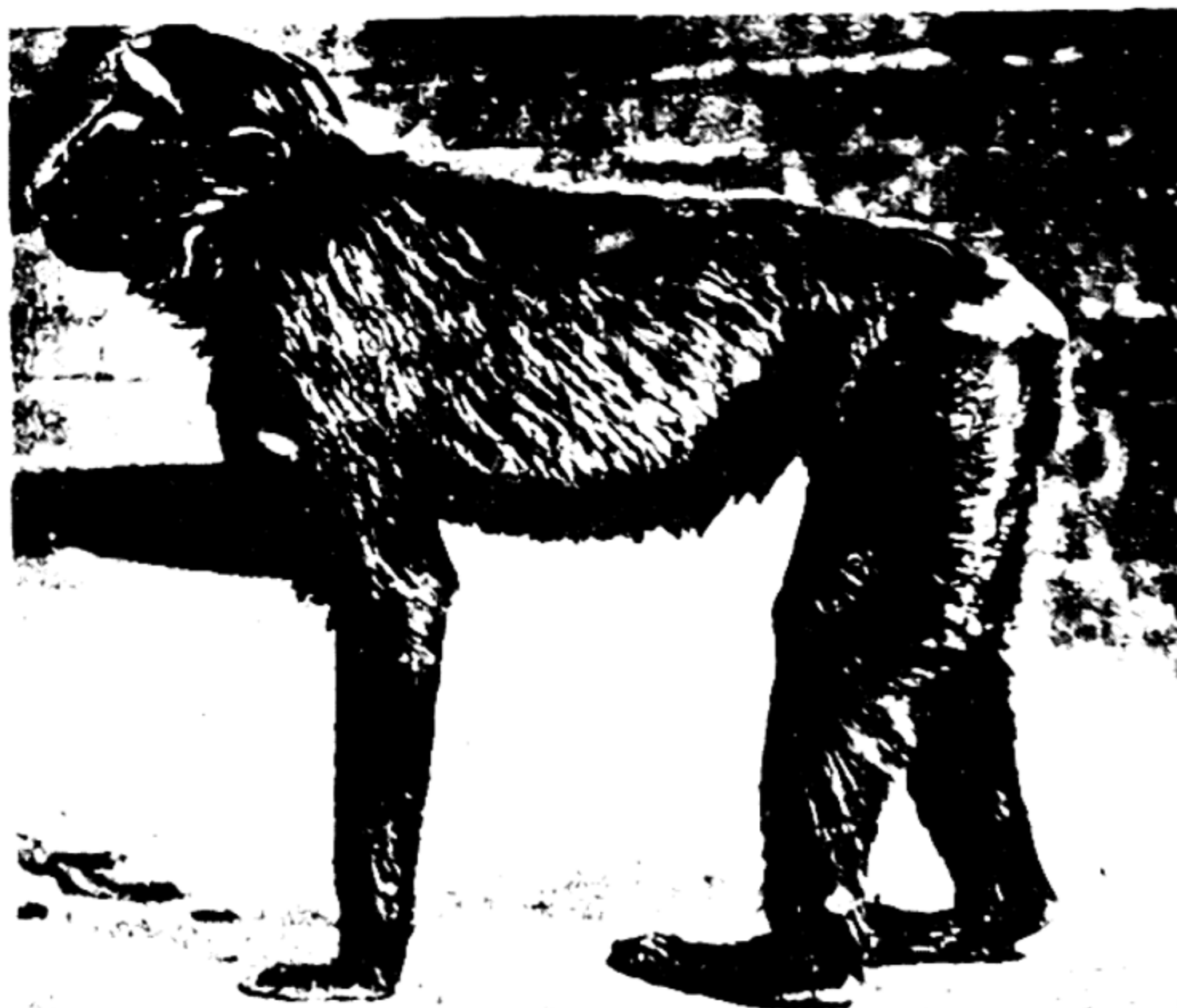
GIBRALTAR OR BARBARY APE (*Macaca sylvana*).
This species has no visible trace of a tail.

islands. But one of the most interesting of all the group is the Gibraltar or Barbary Ape (*M. sylvana*), which somewhat resembles the Japanese Macaque, but has no visible trace of the tail. The natural home of this Monkey is the mountainous parts of Morocco and Algeria, its wide geographical isolation from the rest of the group being remarkable. A troop generally believed to be the descendants of specimens brought from Barbary and liberated, inhabits the precipitous cliffs of Gibraltar, where it lives under the

protection of the Governor and has been maintained by fresh importations from northern Africa.

The last of the Macaque group is the Black Ape (*Cynopithecus niger*), often, but wrongly, supposed to belong to the Baboons on account of the ridges on the upper side of the muzzle. This feature and a crest on the top of the head serve to distinguish it from the Moor Macaque of the same country, with which it is often confused. But quite recently it has been found to intergrade with the Moor Macaque.

Most of the Monkeys of this family referred to above are commonly imported for exhibition or for sale to private owners. They are usually captured when quite young, perhaps about a year old, and



[Photos]

[W. S. Barwick]

BLACK APE (*Cynopithecus niger*).
Because of the ridges on the upper side of the muzzle, this Macaque is often, but wrongly, supposed to belong to the Baboons.

MAMMALIA (ORDER PRIMATES)

are then attractive, amusing, if exacting pets. They reach maturity at about five years old ; and thereafter they become more and more unmanageable and subject to fits of violent temper, which, coupled with their fearlessness of men and their terrible canine teeth, make them dangerous to keep any longer. This applies particularly to the males, which are more courageous and powerful than the females. The age to which they attain under natural conditions is unknown, but a Common and a Rhesus Macaque have been kept in captivity for twenty-nine and thirty years respectively ; and a Mandrill that was exhibited some years ago in the Zoological Gardens, London, died when he was several years older than that.

Family Colobidae (*Langurs and Guerezas*)



[F. IV. Bond.]

DUSKY LANGUR.

Langurs are found in tropical Asia and Africa ; but, as a rule, do not thrive well in captivity.

The *Colobidae* are distinguished by the absence of cheek-pouches and the presence of accessory, sack-like swellings in the stomach. The newly-born young differ remarkably in colour from their parents. These Monkeys feed mainly on the foliage of the trees in which they spend most of their time and in which they are perfectly at home, passing from branch to branch with prodigious leaps, often

swinging from one to another with their hands. As in all active arboreal Monkeys, the tail is long, to serve as a balance. They are found in tropical Asia and Africa ; but, as a rule, do not thrive well in captivity.

Langurs. The most familiar to Europeans is the typical Indian species, the Langur, Hanuman or Entellus Monkey (*Semnopithecus entellus*), a big black-faced, mostly greyish species represented by many local races in India and Ceylon. Its familiarity is due to its being regarded as sacred in many districts, and being unmolested, it is so fearless of Man that it may frequently be seen about the temples or on the roofs of village houses. But its natural home is in the hill forests, where it is almost as active in getting about over rocky ground as in the trees. The finest specimens are found in the Himalayas, where it is known as the Grey Ape. It may ascend to twelve thousand feet or so, and has been seen in the pine trees

LANGURS (FAMILY COLOBIDAE)

laden with snow. It is a large, powerful Monkey, the head and body measuring between two and a half and three feet, the tail being a little more in length. In addition to leaves and shoots, this Langur eats fruits and in the villages it does great damage by raiding gardens and grain fields.

In the countries between and including Burma and Borneo, there is a large number of other species and local races, differing in colour, size and a variety of ways and known to the Malays as Lotongs.

Closely resembling the Himalayan Langur in size, habits and its power to withstand cold is the Snub-nosed Monkey (*Rhinopithecus roxellanae*), which inhabits the forests of Szechwan in China, and takes its name from the face being disfigured by a little, triangular nose, up-tipped in such a way that the nostrils open forwards. The colour of this Monkey is brownish above and yellowish below and on the cheeks; but other species from China are differently coloured.

Still more eccentric in appearance than the last is the Proboscis Monkey (*Nasalis larvatus*) of the tropical forests of Borneo. In the female there is a shortish, thick nose projecting forwards above



(D. Sear Smith)

CAPPED LANGUR AND YOUNG.

Langurs feed mainly on the foliage of the trees in which they spend most of their time.

MAMMALIA (ORDER PRIMATES)

the upper lip; but in the full-grown male this snout is much longer and thicker and hangs down over the mouth to the level of the chin. The use of these noses is quite unknown. The Proboscis Monkey is about the size of the Himalayan Langur, and its general colour is reddish-yellow.

Guerezas. The Guerezas (*Colobus*) differ from the Langur group in having, at most, a vestige of the thumb. They are restricted to the forests of Central Africa. There are many species



[W. S. Forridge.
SNUB-NOSED MONKEY
(*Rhinopithecus roxellanae*).
The small, triangular nose is up tipped so that the nostrils open forwards.



[Günther.
PROBOSCIS MONKEY (*Nasalis larvatus*).
In the full-grown male, the snout hangs down over the mouth to the level of the chin.

belonging to two categories known as the "Red" and the "Black and White" Guerezas respectively. The former are typically red and black in varying proportions; the Bay Guereza (*C. badius*), of West Africa, being an example. The Black and White Guerezas have long coats varying in colour from wholly black, as in the West African Black Guereza (*C. satanas*), to mostly white, as in the white-tailed Kilimanjaro race of the Coramon Guereza (*C. abyssinicus*). In

MAN-LIKE APES (ANTHROPOMORPHA)

this race the crown of the head, the shoulders, the limbs and the root of the tail are black ; but the flanks and loins are covered with a cloak of long, white, silky hair and the end of the tail is similarly adorned. A fancied resemblance between the coats of these Black and White Guerezas and the clerical garments known as the cassock and surplice has earned for these animals the name of " Bishop Monkeys." Their handsome liveries are said to render these Monkeys indistinguishable from the festoons of white lichen which grow on the boughs of the trees they frequent.

ANTHROPOMORPHA

(Man-like Apes)

Family Simiidae (*Gibbons, Orang-utans, Chimpanzees and Gorillas*)

Setting Man on one side and neglecting certain anatomical differences, the Man-like Apes are distinguished from the typical Monkeys of the Old World by having the arms much longer than the legs, the hands never much shorter than the feet, with the thumb more freely jointed from the wrist and the pads of the soles and palm practically undeveloped ; also there is never a trace of an external tail. In walking in the quadruped attitude, the palms of the



[W. S. Berridge.
WHITE HANDED GIBBON (*Hylobates lar*).
The long arms easily reach the ground when the animal is standing in an upright attitude.

MAMMALIA (ORDER PRIMATES)

hands are never applied to the ground, the bent knuckles of the fingers being used instead and the entire sole of the foot, or its outer edge, supports the weight of the hindquarters, which, as compared with the shoulders, are weak and light. In tree-climbing the powerful arms are principally employed for swinging from branch to branch, when speed is desired, the legs being too feeble for long leaps.

The period of gestation, where known (*Chimpanzee*), is nine months.

Gibbons (*Hylobates*). These are the smallest of the Apes and differ from the rest in having horny sitting pads on the rump, as in the Old World Monkeys, a more lightly-built body, longer limbs, the arms easily reaching the ground in the upright attitude despite the longer legs, and the thumb and great toe better developed. There is no difference between the sexes in size. They live in the East Indies, ranging from Assam to Cochin China and Borneo, and are represented by some five or six species, all tolerably closely allied and exhibiting great individual variation in colour. The Hoolock (*H. hoolock*), from Assam and Burma, is black or brown, with a white band over the brows; the Lar or Wau-wau (*H. lar*), from Malaya, is black or fawn and has white hands and feet; Harlan's Gibbon (*H. concolor*), from Cochin China, has the hair on the crown erect, and is black or grey when full grown, fawn when young. There is no marked difference in their size. Standing erect, they are usually about two and a half feet, the head and body measuring one foot eight inches or so.

The habits of all the different kinds are very similar. They are diurnal, gregarious and essentially forest dwellers, spending most of their time in the tree-tops, but not infrequently coming to the ground, and by reason of their lightness of build, longer arms and better-developed legs, greatly excel the other Apes, both in arboreal activity and in the speed with which they traverse the ground. When walking slowly on the ground, they assume the erect posture, spreading the great toe inwards as a prop, but do not use the knuckles of the hand to rest on, merely the tips of the fingers now and again touching the ground lightly. In this posture they can run at very considerable speed, especially when young, and the arms are then raised aloft as balancers. Their balancing power in the upright attitude is surprising. They can walk with ease along a horizontal branch or rope, gripping it with the great toe and holding the arms out sideways. No less remarkable is the speed and precision with which they can traverse the forests, swinging arm over arm from bough to bough with the legs tucked up out of harm's way. No other Ape or Monkey can travel through the trees as they do, and Man is the only Primate which excels them in bipedal running on the ground.

Their diet consists of fruit, leaves, insects and spiders, eggs and small birds when they can catch them. They drink either by dipping their mouths into water, or by picking it up on their fingers.

MAN-LIKE APES (ANTHROPOMORPHA)

They are very noisy animals, shouting and calling in concert from the tree-tops, especially in the early morning and evening; the names "Hoolock," given to the Burmese species, and "Wau-wau," to the Malayan Gibbons, being derived from their voices, which are a better



From the Paramount Film]

["Rango"]

ORANG-UTAN (*Simia satyrus*).

In trees these Apes are perfectly at home, their whole organization being adapted to climbing.

MAMMALIA (ORDER PRIMATES)

guide to their identification than colour or other characters. One of them, indeed, the Siamang (*H. syndactylus*), a larger black species found in Sumatra, has a great vocal sac which expands like a bladder under the jaws and gives a booming, resonant, far-carrying cry.

Although Gibbons are commonly exhibited in our larger menageries, they seldom live long in captivity; and, apart from their spectacular acrobatic feats and their not unmelodious concerts, they are not so entertaining as the higher Apes or the commoner Monkeys.

Orang-utan (*Simia satyrus*). This Ape is less human in organization than either the Gorilla or the Chimpanzee. The crown of the head is higher, the ears very small, and the less prominent brows and flatter nose give a very different expression to the face. The arms are longer even than in the Chimpanzee, reaching to the ankles when the Ape is erect, but the legs are weaker, the hands and feet narrower, with the thumb and great toe smaller, but the other digits are longer; the foot, moreover, is jointed to the ankle in such a way that its outer edge rests on the ground during progression. The body is covered with long, shaggy, reddish-brown hair, shorter on the head, where it often forms a fringe on the forehead and passes down in front of the ear to the chin like the whiskers and beard of Man. The skin of the face is slate-grey. The adult male stands about four and a half feet, about the same height as the Chimpanzee, but the body is bulkier and the head larger. The female is much smaller, not more than four feet high.

This Ape is restricted to the forests of Sumatra and Borneo. There seems to be only one species, although it was at one time thought that males which develop great fibrous expansions on the sides of the face represented a species different from those in which these swellings do not appear. This is now regarded as an individual variation only. As might be inferred from the structure of its limbs, the Orang is almost exclusively arboreal, seldom descending to the ground, where its movements are slow and laboured. On account of the weakness of its legs, the twist of its foot and the weight of its body, the adults never stand erect and are probably unable to do so for more than a moment. The young, however, can both stand and walk on their legs, without the aid of their arms, although not easily. In trees these Apes are perfectly at home, their whole organization being adapted to climbing. They sometimes travel along the upper side of branches, but just as frequently beneath them, like a sloth, their long, hook-like digits giving them a secure hold. They never leap, but often swing from branch to branch, using their arms alone, but are careful not to let go the hold of one hand till the other has got a firm grip. They are not truly gregarious, being met with only in small family parties. In their native haunts they are said to be purely vegetable feeders, living on fruits and leaves, but probably they eat eggs. A specimen in the Zoological Gardens, London, at all events, was very fond of them, taking

CHIMPANZEE (*ANTHROPOPITHECUS*)

a whole hen's egg into his mouth, crushing it, and spitting out the shell, without losing a drop of the semifluid contents. For resting at night they make a platform by cleverly twisting branches together, the work being effected with great rapidity.

The span of life of Orang-utans in captivity in Europe is generally short, but they may live several years. A male, for instance, exhibited several years ago in the Zoological Gardens, London, was kept in Singapore for eight years before being imported to England in 1905. He died in 1929; assuming, therefore, that he was two or three years old when captured, he was about thirty-five years old at the time of death. In Singapore he was taught to smoke, and nothing pleased him more than a pull at a pipe or cigar, his way of expelling the fumes through his nostrils being most human.

Chimpanzee (*Anthropopithecus*). The Chimpanzee shares with the Gorilla the distinction of being the most man-like of the Apes. It is much smaller than the Gorilla both in stature and bulk and may be at once distinguished from it at all ages by its much larger ears and the unswollen rims of the nostrils. The

arms also are a little shorter, reaching about to the knees when the Ape is erect; and the hands and the feet are narrower, more adapted for climbing, the toes being unwebbed. The height of the male standing upright is about four and a half feet, of the female, about six inches less.

They inhabit the forests of West and Central Africa and are more plentiful than Gorillas. Several different kinds, distinguished principally by colour, have been named, but to all intents and purposes they are local races of the typical Chimpanzee (*A. troglodytes*). The head and body are usually covered with coarse black hair, but the head may be bald as in the kind known as the Nshicgo-Mbouvé. Sometimes the hair is brown



By courtesy of [Carl Hagenbeck's Tierpark, Stellingen].
CHIMPANZEE (*Anthropopithecus troglodytes*).
Chimpanzees inhabit the forests of West and Central Africa. There are several different kinds, distinguished principally by colour.

MAMMALIA (ORDER PRIMATES)

and the skin of the face may be black or pallid, the muzzle in Sierra Leone specimens being white.

In their habits Chimpanzees do not differ greatly from Gorillas, except that they are more arboreal, better climbers and altogether more active both in trees and on the ground. On the ground their gait is quadrupedal when traversing an open space; but where the undergrowth is thick and especially when they are alarmed, they go through it in a slanting position, often at some speed, using their arms to push aside the creepers or to help themselves along by the tree-stems. When climbing they never leap from branch to branch, but either move along their upper sides, using both hands and feet, or swing from one to another, arm over arm, beneath, never letting go the grasp of one hand until the other has got a hold. But when they wish to descend rapidly to the ground, they drop from bough to bough, checking their fall with their hands as they come down. When shot at aloft, they usually descend in this way and make off on the ground or they hide in the foliage, never bounding away through the tree-tops like Monkeys. They also differ from the Gorilla, usually a silent animal, in periodically making the forest resound with concerted vociferous howls and cries.

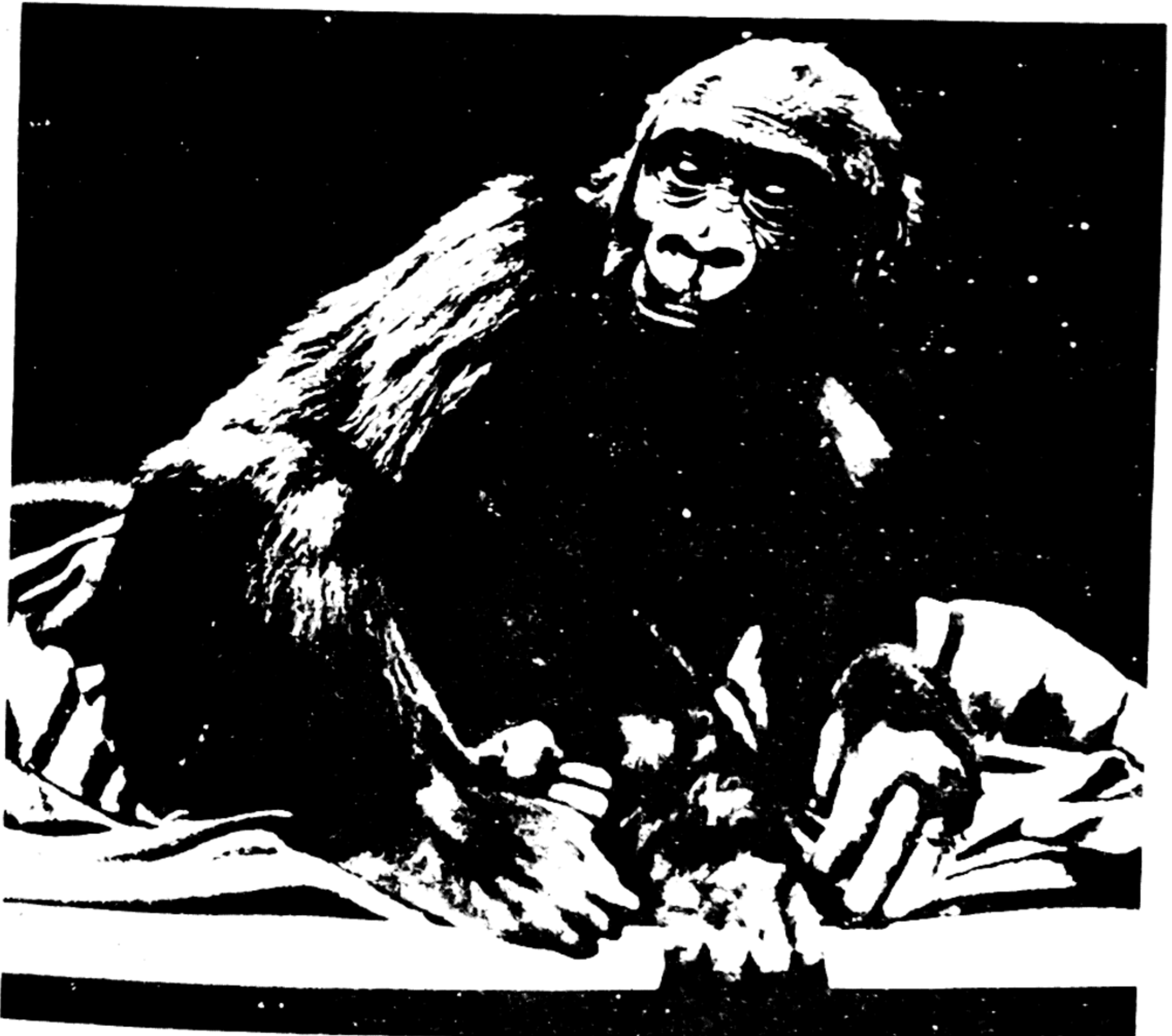
Chimpanzees withstand conditions of captivity much better than Gorillas and are temperamentally more lively. They frequently live many years even under the unfavourable conditions of Zoological Gardens, and in Cuba they have been bred and reared to maturity. From observations on Chimpanzees kept in that island, it has been ascertained that the young are weaned in about twelve months, and reach maturity when ten to twelve years old, a little earlier in the female than in the male. It has been estimated that under favourable conditions the span of life is not far short of Man's. Within the last few years these Apes have also been bred in England and on the Continent.

Gorilla (*Gorilla*). This Ape may be distinguished from the other Man-like Apes by its much greater size, the thickly-expanded rims of the nostrils, beetling brows, broad hands with short, stumpy fingers, and broad foot with the four small toes tied together by webs in the basal half. The arms, when the animal is standing up, reach halfway between the knees and ankles, being intermediate in that respect between these limbs in the Chimpanzee and Orang-utan; and the ears, although much smaller than in the Chimpanzee, are larger than in the Orang. In none of these three Apes are there horny sitting pads on the rump, which are present in Gibbons.

The standing height of a large male Gorilla is up to about five and a half feet, sometimes more; but it may attain the prodigious weight of six hundred pounds. The female is much smaller, seldom exceeding four and a half feet. The head and body are massive and heavy, as compared with the short legs; and the head, on account of the shortness of the neck, appears to arise between the shoulders.

GORILLA (GORILLA)

Its habitat is the forest of equatorial Africa, from the Cameroons and Gaboon eastward to the Great Lakes. Several different kinds have been named, mostly on variations in the colour, which is typically black, generally grizzled, especially in old animals; a grey saddle on the back is a common feature in the males and there is often a good deal of reddish-brown on the head, neck or even shoulders.



[D. S. Smith.]

YOUNG GORILLA (*Gorilla*).

A large male may stand up to a height of five and a half feet or more, and may attain the prodigious weight of six hundred pounds.

The Gorillas that were first made known to Europeans came from the Gaboon and other parts of West Africa, and exaggerated accounts of their ferocity and prowess, based mainly on native reports, were published in earlier natural histories. They were said to carry off negro women, to lower themselves from the forest trees and grasp with their feet the throats of natives passing beneath, to belabour with clubs the trunks of elephants plucking the foliage and to attack men at sight unprovoked. None of

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these stories is true ; and later familiarity with them has shown that they are comparatively inoffensive, making off through the forest on the approach of Man, although terrible antagonists if wounded and forced to fight. Alike erroneous is the prevalent idea that they habitually stand and walk upright, an idea fostered to this day by the manner of mounting them in museums. They raise themselves on their legs to get a wider range of vision or to look inquisitively at an intruder and may beat their breasts with their hands, as the old stories said ; but when undisturbed, their gait is quadrupedal, the immense weight of the body and comparative weakness of the legs making bipedal progression for any distance a practical impossibility in the adult. The young, however, stand and walk with some facility and not infrequently in the erect attitude. Although good, if on the whole slow, climbers, they generally keep to the ground, the males even sleeping at the foot of trees, but the females and young go aloft and repose in platform nests made of interwoven branches. Their terrestrial habits may be explained by the absence of enemies. A leopard might pounce on a stray young one or possibly a female, but these are usually in the company of the male of the family party, a beast too formidable to be faced. They are purely vegetarian in diet, eating fruits and succulent green plants, very occasionally, it is said, raiding the plantations of the natives.

The typical Gaboon Gorilla (*Gorilla gorilla*) lives in hot, tropical forests ; but the so-called Mountain Gorilla, which is found just to the west of the Great Lakes of Africa, occurs at tolerably high altitudes, where the jungle is often drenched in mist and even Europeans require fires for warmth at night.

Young Gorillas have from time to time been exhibited in the Zoological Gardens ; but in the past these Apes, as a rule, have never lived long in menageries in Europe. It is hoped, however, that the difficulties of keeping these Apes alive in captivity in England have now been overcome. A few years ago a young male, known as " John," was kept by a lady as a private pet in London and enjoyed perfect health for two years. At the end of that period the owner was unfortunately compelled to part with him, and he did not long survive the loss of the companionship to which he was accustomed. He differed from all the other young Gorillas previously imported to this country in being docile and affectionate with human beings from the first ; this was probably due to his having been suckled and nursed, it was alleged, by a negress in Africa before being shipped to England.

